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*Measurement, Determinants and Consequences of Forward-Looking
Reporting Disclosure*

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List of Abbreviations

AG	Aktiengesellschaft (Stock corporation)
AIMD	Artificial Intelligence Measurement of Disclosure
AIMR	Association for Investment Management and Research
ASCG	Accounting Standards Committee of Germany
BaFin	Bundesanstalt für Finanzdienstleistungsaufsicht (German Federal Financial Supervisory Authority)
BAS	Bid-ask spread
BilMoG	Bilanzrechtsmodernisierungsgesetz (German Accounting Modernization Act)
BilReG	Bilanzrechtsreformgesetz (Reform Act on Accounting Regulations)
BMW	Bayerische Motoren Werke (company)
CSR	Corporate Social Responsibility
DAX	German Stock Index (comprising 30 strongest shares)
Dr.	Doctor
Dr. rer. pol.	Doctor rerum politicarum
EBT	Earnings before Taxes
EBIT	Earnings before Interests and Taxes
EBITDA	Earnings before Interests Taxes, Depreciation and Amortization
ed.	Edition
e.g.	Exempli gratia (for example)
EPS	Earnings per Share
etc.	Et cetera (and so on)
FAF	Financial Analysts Federation Corporate Information Committee
FMC	Fresenius Medical Care (company)
FREP	Financial Reporting Enforcement Panel
GAS/DRS	German Accounting Standard/Deutscher Rechnungslegungsstandard
GASB	German Accounting Standards Board
GCC/HGB	German Commercial Code/Handelsgesetzbuch
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GI	General Inquirer

GRI	Global Reporting Initiative
HDAX	German Stock Index (comprising DAX, MDAX and TecDAX)
i.a.	Inter alli (among other things)
IAS	International Accounting Standard
IASB	International Accounting Standards Board
ICFA	Institute of Chartered Financial Analysts
IFRS	International Financial Reporting Standard
IPO	Initial Public Offering
K+S	Kali und Salz (company)
LIWC	Linguistic Inquiry and Word Count
MD&A	Management Discussion and Analysis
MDAX	German Stock Index (Mid Cap-Index)
n/a	Not applicable
OLG	Oberlandesgericht (Higher Regional Court)
OLS	Ordinary Least Square
p.	Page
Prof.	Professor
R&D	Research and Development
SDAX	German Stock Index (Small Cap-Index)
SSRN	Social Science Research Network
TecDAX	German Stock Index (Technology-Index)
VIF	Variance Inflation Factor
Vol.	Volume
UAE	United Arab Emirates
U.K.	United Kingdom
U.S.	United States
vs.	Versus
WHU	Wissenschaftliche Hochschule für Unternehmensführung

List of Symbols

EUR	Euro
H	Hypothesis
j	Index variable for number of firms
N	Number of observations
p	p-value
R^2	Coefficient of determination
t	Number of time periods
β_0	Intercept
β_j	Regression coefficient
ε	Error term
Σ	Sum
%	Percent

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1 Introduction

Voluntary disclosures, their measurement, their determinants, and their consequences have been a frequent topic of prior research. Voluntary forward-looking information provided in German management reports is of particular interest, because 1) forecasts are important for investor decision-making, 2) imprecise or no disclosures can cause distrust and attract regulatory attention, and 3) specific requirements for Germany lead to a “hybrid” between mandatory and voluntary disclosures.

Disclosure is a complex function that depends on several different internal (company-specific) and external factors (e.g., culture, legal system, institutional background) (Beyer et al. 2010).¹ The full disclosure principle encompasses the disclosure of “any financial facts significant enough to influence the judgment of an informed reader” (Kieso et al. 2011, 55). Disclosure is generally classified as either mandatory or voluntary. Voluntary disclosure is usually considered as the provision of information that is in excess of mandatory requirements and is not done for compliance purposes (Verrecchia 2001). Examples are management earnings forecasts, corporate social responsibility reporting, and forward-looking reporting. Mandatory disclosure is given when a company complies with the disclosure requirements of a standard, a regulation, a law, etc. Most quarterly and annual report disclosures are mandatory.

The type of information that is voluntarily provided by management depends on several factors. Thus prior studies categorize the disclosure literature. Verrecchia (2001) classifies the disclosure literature as association-based, discretionary-based, or efficiency-based. Association-based disclosure literature analyzes the effects of exogenous disclosure on changes in investors’ individual actions. The discretionary-based disclosure literature examines how managers use discretion to reveal additional information about companies. Efficiency-based

¹ For a more detailed description of disclosure studies and general research, see Verrecchia (2001), Healy and Palepu (2001), and Beyer et al. (2010), which all give overviews.

disclosure literature evaluates which strategy is chosen if there is no prior knowledge (Verrecchia 2001).² Healy and Palepu (2001) classify disclosure studies according to regulations, intermediaries, manager decisions, and capital market consequences.³

Disclosure decisions are generally driven by the trade-off between costs and benefits (Verrecchia 1983, 2001). Benefits of disclosure can be reduced information asymmetries (Petersen and Plenborg 2006; Brown and Hillegeist 2007), lower costs of equity capital (Botosan 1997; Kristandl and Bontis 2007), lower costs of debt (Sengupta 1998), higher stock returns, a larger analyst following, or higher levels of institutional ownership (Healy et al. 1999; Lang and Lundholm 1993). The costs of preparing and providing the information are a major reason for non-disclosure. Potential costs can arise for example from collecting and processing the information, dissemination and auditing, and proprietary costs (Verrecchia 2001). A possible explanation of the cost and benefits of disclosure is given by the agency, signaling, political cost and proprietary cost theory.

Agency theory deals with the relationship between principals (e.g. owners) and agents (e.g. managers), assuming that ownership and control of a company are separated (Jensen and Meckling 1976). Between those two parties conflicts arise due to different interests, goals and information asymmetries. Jensen and Meckling (1976) classify the arising costs in monitoring and bonding costs and a residual loss. Monitoring costs arise for the principal to control the activities of

² The analysis of forward-looking disclosure determinants of the empirical study in chapter 3 relates to discretionary disclosure, as it explores the incentives of firms to disclose information. The empirical study in chapter 4 that addresses the consequences of disclosure can be classified as efficiency-based, because disclosure is linked to efficiency via the information asymmetry component of the cost of capital (Verrecchia 2001).

³ In terms of their classification scheme, my research addresses the categories, managers' disclosure decisions for the determinant study in chapter 3, and capital market consequences for the consequences study in chapter 4 (Healy and Palepu 2001).

the agent (e.g. auditor cost⁴) (Deegan and Unerman 2011). Monitoring costs can be reduced by financial reporting in general (Watts 1977) and in particular by voluntary disclosure (Verrecchia 2001). Bonding costs occur on the side of the agents, an example is the preparation of financial statements to inform the owner appropriately and to mitigate information asymmetries (Deegan and Unerman 2011; Jensen and Meckling 1976). The last component, residual loss, is a wealth effect which occurs besides monitoring and bonding costs through the different activities of principal and agent (Subramaniam 2006).

Due to information asymmetries, the problem of adverse selection occurs (Brown and Hillegeist 2007; Furubotn and Richter 2005). The *signaling theory* shows how to address this problem (Furubotn and Richter 2005; Ross 1977) by assuming that one party is better informed (manger = agent) due to the inside position in the company. The better informed party (agent) can (voluntarily) provide information to the market with the aim of economic benefit (Hughes 1986; Morris 1987; Spence 1973). Disclosure can be considered as a signal of superior quality of the firm in comparison to the competitors as the company (voluntarily) provides information (Bar-Yosef and Livnat 1984; Watts and Zimmerman 1986), leading to a reduction of adverse selection and information asymmetries (Akerlof 1970). Firms withholding information in contrast might create the impression of a bad performance as they do not reveal their numbers (Morris 1987; Riahi-Belkaoui 2004). In the context of my study, forecasts can also be seen as a signal. High quality firms are more likely to release good quality forecasts in order to give a signal about their position to the market (Scott 2009).

Political cost theory deals with the relationship between companies and other parties such as regulators, unions, tax authorities etc. Financial statements can serve as a source for these different stakeholders to claim their interests. Firms

⁴ Other examples for monitoring costs are budget restrictions or costs for defining operating rules.

with a poor reporting performance are more in the focus of interest (Watts and Zimmerman 1978). Thus, firms (especially political visible firms) might use financial reporting and in particular voluntary reporting to avoid the attention of external parties and hence reduce the risk of potential political costs (Belkaoui and Karpik 1989; Deegan and Gordon 1996). For the German market an example for an authority is the FREP. Low quality and errors in the reporting are documented and in severe cases prosecuted by the authorities. Prior work shows that especially large firms are more prominent and focused by various financial statement user groups and thus the pressure on these companies is higher (Deegan and Unerman 2011; Watts and Zimmerman 1978).

Proprietary cost theory deals with the competitive disadvantage costs of informing competitors by releasing information voluntarily (Verrecchia 2001). Providing additional prospective information might be advantageous in order to reduce the conflicts between company insiders and other interest groups and to increase a firm's credibility and transparency (Skinner 1994). But releasing more than mandatory information might be disadvantageous as competitors might use the disclosed information in an unfavorable way (Verrecchia 1983, 2001).

My analysis focuses on German forward-looking reports which are a mandatory part of German annual reports. Sections 289 and 315 of the German Commercial Code (GCC) mandate the provision of management reports that contain a forward-looking report in which future developments and forecasts are reported. The GCC only mentions minimum disclosure requirements. Further information about scope, structure, items to be reported, time horizon of forecasts, assumptions and other relevant parameters are not required by law. Consequently, the forward-looking report can, to some extent, be viewed as a form of voluntary disclosure subject to management's decisions. The setting of German forward-looking reports is rather unique. Firms must provide forward-looking information within their audited financial statements, although the regulations are sufficiently vague to allow for great variation in the quality, scope, and quantity of disclosures.

Thus, the way German firms tend to use forward-looking reports, and what the level of disclosed information is needs to be explored.

One reason for providing additional prospective information is to reduce conflicts between company insiders and other interested groups arising from, e.g., information asymmetry (Healy and Palepu 2001). “High-quality information is information useful to users in making economic decisions” (Beretta and Bozzolan 2008, 371). It is important to observe if there are any differences in firms’ forward-looking reporting behavior and to determine why such differences may exist, which parameters influence the reporting behavior and what results from a high disclosure level. These issues are addressed in the following three main research questions:

Research question 1:

What are the characteristics of disclosure indices, and how do differences in self-constructed indices occur?

The purpose is to show how disclosure indices are used in related work, and how self-constructed indices can be compiled. In prior research, various methods are used to measure disclosures because there is no consensus about which is best. But how to choose an appropriate index is critically important, because it has a strong impact on the results. I summarize the different possibilities for disclosure measurement, distinguishing particularly between self-constructed and existing indices.

For a self-constructed index, I address and discuss the possibilities for the construction process. I use three different self-constructed measures for German forward-looking disclosure: quality, scope, and quantity. I measure forward-looking disclosure quality and scope using indices that aggregate distinct information items that have been hand-collected from sample firms’ audited financial statements. In contrast, quantity is measured as the number of words in the forward-looking report. I show the construction and the use of the different

indices, as well as the effects of modifications on the results. Additionally, I consider validity and reliability measures.

Research question 2:

How does the global financial crisis affect the quality, scope, and quantity of German forward-looking reports?

I study the effect of the extreme uncertainty evoked by the 2008 global financial crisis on disclosure behavior. I analyze the quality, scope, and quantity of forward-looking disclosures during both crisis and non-crisis periods. I also control for other determinants of disclosure behavior. Prior research has not distinguished clearly among these three disclosure dimensions and their determinants. Also, the impact of the recent financial crisis on forward-looking disclosure behavior has not yet been examined empirically.

Research question 3:

How does forward-looking reporting quality influence information asymmetry, as proxied for by the bid-ask spread?

I analyze the relationship between forward-looking reporting quality and information asymmetries. As a proxy for information asymmetries, I use bid-ask spreads, because prior research has found them to be credible.

However, I note that prior research has also not explicitly addressed the relationship between forward-looking reporting and information asymmetries. The focus of earlier studies has either been overall corporate reporting, or a particular class of forecasts. I try to fill this gap by considering all the dimensions of a forecast disclosed in the forward-looking report, as well as its direct relationship with bid-ask spreads.

I regress the bid-ask spread on the forward-looking disclosure quality and control variables for information asymmetry. Quality is measured by the self-constructed index in chapter 2, which considers all types of forecasts disclosed in the forward-looking report. And, in addition to the common controls for bid-ask

spreads, I control for any other information released in the annual report besides the forward-looking information.

My sample consists of firms listed on the German HDAX (DAX, MDAX, TecDAX) and SDAX for the years 2005-2009 as these firms are the largest in their respective fields.

For research question 1 I provide evidence that quality and scope disclosure index scores develop similarly over time, showing an increase from 2005 through 2007, a decrease in 2008, and an increase again in 2009. The results seem intuitive, as the indices only differ in their weighting of quantitative information. Ranking the companies, I only find marginal differences. The quantity measure however, shows a constant increase in the number of words from 2005 through 2009. I also note different firm rankings than for the quality and scope indices.

For research question 2 I find that forward-looking disclosure quality and scope decreased significantly in times of crisis. The quantity measure confirms that companies still report during crisis by showing an increasing volume of the reported number of words. In the regression analysis I also provide evidence that crisis has an impact on scope and quality, whereas the impact is stronger on the quality index. Additionally, firm size and performance are also significantly related to the disclosure quality and scope respectively. Using quantity as a measure of disclosure I find no relationship with crisis, but a significant relation with firm size, closely held shares and return on equity. These results are also robust to different modifications

For research question 3 I observe a significantly lower bid-ask spread for firms with better forward-looking disclosure quality. By additionally controlling for the variable “other information” I find that the relationship of forward-looking disclosure quality and bid-ask spreads is no longer significant. These results are robust to numerous modifications. Furthermore, I show that firms that have significantly improved their level of quality face lower bid-ask spreads, as long as the change in quality is not too high. Improvements above a certain threshold do

not lead to lower bid-ask spreads. For firms with decreasing levels of quality, I find no relationship. Using a pre-period (2005-2007), and a post-period (2008-2009) I show that firms with improved and decreased quality levels from pre- to post-period face significantly lower bid-ask spreads in the post-period.

The dissertation is organized as illustrated in Figure 1. The measurement of different forward-looking disclosure practices by German firms is the starting point of my thesis in chapter 2. Based on these measures, in chapter 3, I analyze whether different determinant factors have an influence on the level of disclosure (the quality, scope, or quantity). I then study the consequences of the level of reporting on the information asymmetries in chapter 4. In chapter 5, I summarize my findings.

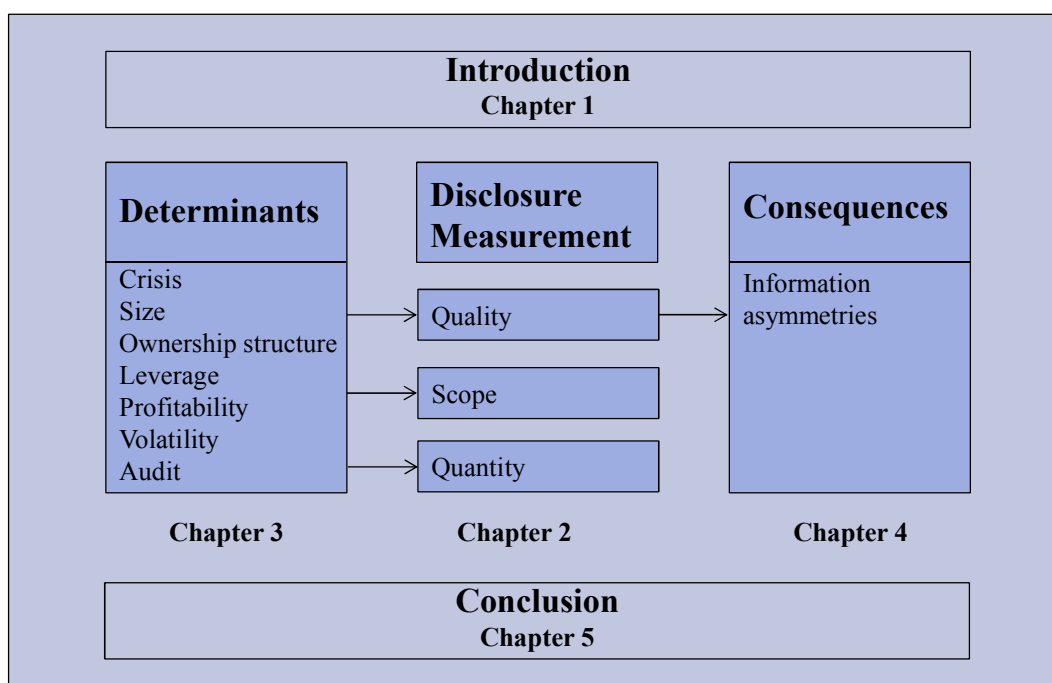


Figure 1: Overview of the Research Project

2 Disclosure Indices, Measurement and Characteristics – Review and Practical Implementation

2.1 Introduction

In this chapter, I first examine the possibilities for the construction of disclosure indices by reviewing prior research. Second, I construct different disclosure indices for German forward-looking reporting. Third, I conduct sensitivity analyses for the use of the different disclosure indices.

Disclosure is the publication of additional important information attached to financial statements that can be of either mandatory or voluntary nature (Healy and Palepu 2001; Verrecchia 2001). Disclosure indices are widely used in accounting research to measure and proxy for the level of disclosure of textual information (e.g., the quality, scope, and quantity). Disclosure indices can reflect compliance with the law (mandatory disclosure), additional clarifying information (voluntary disclosure), or a mixture of both.

The difficulty in research when using disclosure indices is how to choose the index, and which characteristics are most desirable. Researchers must decide whether an existing index is adequate, or whether they need to self-construct their own index. To self-construct an index, researchers must make numerous critical choices, for example, which items should be selected and included in the index? Should a computer-based or manual approach be used for the data analysis? Is a weighted or unweighted index preferable? And which form of weighting is best? These decisions are crucial because they will determine the design of the index, and thus the outcome of the results.

There has been a great deal of research on disclosure indices. I classify prior research into two groups: 1) disclosure review studies, and 2) studies on making use of a disclosure index. The former discuss these indices in a more theoretical way by summarizing prior research and generally include some hints for use. However, these hints tend to be rather dense and concise (Beyer et al. 2010; Healy

and Palepu 2001; Verrecchia 2001). But for example, Marston and Shrikes (1991) and Hassan and Marston (2010) review the use of disclosure indices in the field of accounting more detailed by providing a general summary of the main facts. The second category of studies, report on the theoretical background of disclosure indices within their own index construction, but also in a very brief and often incomplete way. E.g. the coding scheme is not enclosed, described in depth, or comprehensive (Beattie et al. 2004; Beretta and Bozzolan 2008; Bravo et al. 2009). These types of studies explicitly use a disclosure index in their research but primarily focus on one kind of index. Only a few studies use variations of one or different indices. Prior research lacks a complete step by step description of all possibilities that have to be considered while using disclosure indices.

My study tries to fill this gap. The aim of this chapter is threefold. First, I shed light on the different theoretical possibilities for the construction of a disclosure index by illustrating their backgrounds and the different scenarios possible for construction. I describe all aspects and steps of the development of a disclosure index thoroughly, and in more detail than prior research. Second, to apply my theoretical background, I construct different indices to analyze the quality, scope, and quantity of German forward-looking reports. Third, I explore the results for the different index constructions, and I conduct sensitivity analyses.

Compared to prior research, I believe my study takes a broader and more comprehensive approach, first by describing the theoretical background, and then by tying it to the practical implementation of the indices and the robustness of results using a sample of German forward-looking reports. Additionally, because prior disclosure research still faces some limitations and problems, I highlight these shortcomings and address how I believe they can be overcome.

Similarly to Bravo et al. (2009), I also focus on quality, scope, and quantity; however, the design of my indices is different. I construct quality and scope indices based on different guidelines and recommendations than Bravo et al.

(2009) for the content of German forward-looking reports. The two indices include the same items, but differ in their weighting.

Most prior research has focused on unweighted disclosure indices. Some have used weighted indices, but primarily with weighting that comes from stakeholder surveys. In my study, the focus is on weighted and unweighted indices based on different degrees of ex ante forecast precision. This approach has only been used in a few studies (Botosan 1997; Bozzolan and Mazzola 2007). I choose this method because forecast precision, and the information that it imparts, is important to stakeholders (Choi et al. 2010). The quantity measure I use, in contrast, is based on the number of words (or the length) of the forward-looking report.

I compare and analyze the results of the three disclosure measures. For the quality index, I carry out additional slight variations in order to check for robustness and sensitivity.

My sample consists of 579 firm-year observations from 2005-2009 for firms listed on the German HDAX and SDAX.

I find that the quality and scope of forward-looking reporting have developed simultaneously over time. From 2005 to 2007, there was an increase in disclosure quality and scope. However, in 2008, a strong decline is obvious, followed by a new increase in 2009. The quantity measure develops differently. It increases continuously from 2005 through 2009. This implies that firms lower their reporting quality and scope during global financial crisis in 2008, whereas the reported volume still increases.

When ranking the companies according to disclosure score, I note that the variation within the top 10 ranking of quality and scope is quite small, which implies that these two different indices have only a slight effect on my results. But when analyzing quantity, the rankings along quality and scope vary to a greater degree. These results suggest differences due to different disclosure measurement methods, but only marginal differences due to weightings.

The remainder of this chapter is organized as follows. In section 2.2, I explain the theoretical measurement of disclosure, and describe in-depth the limits and problems of disclosure indices. Section 2.3 presents the disclosure index construction for the German forward-looking reports, and addresses different validity and reliability measures that can be used for a self-constructed index. Finally, section 2.4 summarizes my findings and concludes.

2.2 Disclosure Measurement

Measuring disclosure quality and/or quantity is complex, context-sensitive, subjective, and multifaceted (Beattie et al. 2004). One popular approach is to use a disclosure index as a proxy. Marston and Shrivies (1991) note that “disclosure indices are extensive lists of selected items which may be disclosed in company reports” (p. 195). But the construction of the index is usually not defined, and thus a general consensus is not available (Bravo et al. 2009).

The index reflects the disclosure behavior of the company. To make use of a disclosure index, the researcher has to decide which disclosure vehicle is taken into consideration. Different disclosure vehicles can be examined, such as the annual report or just one particular section (e.g., the segment report, the forward-looking report). Other possible vehicles for analysis are press releases, interim or other reports, management earnings forecasts, and financial analyst reports.

While starting with the research project, the researcher can either first make the decision for the use of a disclosure index and then for the adequate disclosure vehicle or vice versa, depending on the research question.

As noted earlier, disclosures and disclosure vehicles are classified as either mandatory or voluntary. Most studies that apply disclosure indices use voluntary disclosure to gauge cross-company differences, while others combine voluntary and mandatory disclosure. The use of mandatory disclosure implies a smaller variation, because all companies must apply the same rules and regulations, at least in developed countries. The regulatory environment in developing countries

may be different, and enforcement may also not be fully developed (Ahmed and Nicholls 1994).

In addition to the construction of a disclosure index, some studies consider the “release,” and examine whether a report has been disclosed. For example, Dhaliwal et al. (2011) use a dichotomous variable in their analysis of corporate social responsibility (CSR) reports that is equal to 1 for release and 0 for non-release. Leuz and Verrecchia (2000) use the introduction of international financial reporting standards (IFRS) as the “event,” and assign 1 for adopters and 0 for non-adopters. However, I do not include these studies as part of my literature overview, because they consider only one item (release/adoption). My focus is prior research on complete disclosure indices that include more than one item.

There are several measurement methods. After the choice for the disclosure vehicle and the use of a disclosure index, Figure 2 illustrates how disclosure indices can be either self-constructed or existing. Beattie et al. (2004) classify these categories as semi-objective (= self-constructed) or subjective (= existing indices). Prior research uses mostly self-constructed indices, because there are few publicly available indices, and those that exist do not always fit the purpose of the research question.

Thus, after deciding to self-construct an index for the, it is necessary to develop a list of items on which to base the analysis. For example, will the data be collected manually or via computer? Should the index be weighted or unweighted? And there are further options available to choose for the weighting. On the one hand, the weighting can come from a stakeholder survey; on the other hand, the weighting can come from the nature of the information (e.g., whether it is quantitative or qualitative). The next subsection explains the different steps in more detail, and uses a decision tree as an illustration.

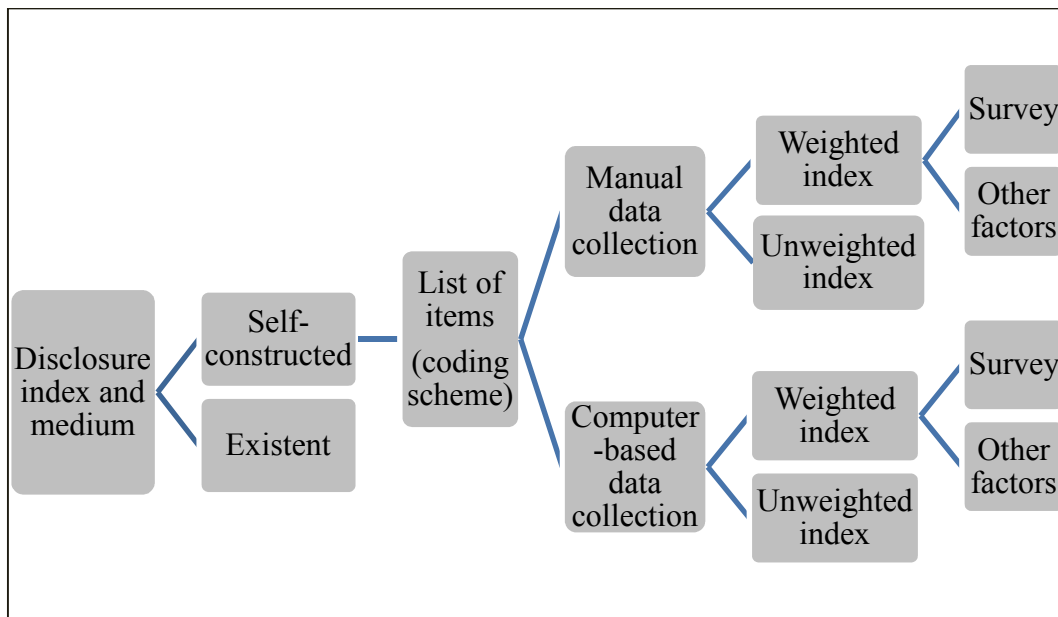


Figure 2: Disclosure Index: Possibilities

2.2.1 Self-Construction and List of Items

To self-construct an index, a researcher must define the relevant items to be analyzed and included in the index calculation. The usefulness of the disclosure index is “critically dependent on the selection of items to be included in the index” (Marston and Shrivs 1991, 195). Creating the list can be difficult, because there is no general theory or rule about the number of items or how they should be selected (Wallace et al. 1994). Depending on the focus of the study, the number and the content (e.g. voluntary vs. mandatory) of the items can also vary greatly. Thus, it is important to establish a basis with an adequate theoretical background that is objective and will be verifiable at all times (Guthrie et al. 2004).

Prior studies use a framework (if available)⁵ and/or prior literature as the basis for the list of items. For example, in the field of corporate disclosure, the Jenkins Report is often referred to as the basis (Botosan 1997; Robb et al. 2001; Vanstraelen et al. 2003). The field of CSR disclosure usually uses the Global

⁵ For most research question, no adequate framework is existent. Thus, prior literature is mostly taken into consideration as a basis for the development of the disclosure index.

Reporting Initiative (GRI) framework (Gamerschlag et al. 2011; Guthrie et al. 2008). Additionally, many studies use local standards or frameworks from their respective fields or countries. Beattie et al. (2004) use a framework based on four categories: 1) time orientation (e.g., historical, forward-looking, non-time-specific), 2) financial or non-financial, 3) quantitative or non-quantitative, and 4) topic-related. The information in the analyzed reports is then classified according to those four criteria. The disclosure index of Beretta and Bozzolan (2008) is based on a similar concept, and contains information about the richness and quantity of the information. *Richness* on the one hand encompasses *width*, which includes the different topics and subtopics that are covered in the report. It also, on the other hand, includes *depth*, measures about the outlook profile (historical, forward-looking, non-time-specific), the type of measure (financial/non-financial, quantitative/qualitative), and the economic sign (positive, negative, not disclosed) of the given information. *Quantity* contains the relative number of disclosed items.

2.2.1.1 Data Collection and Analysis

To operationalize and measure the level of disclosure, text must be transformed into a more quantitative form (Krippendorff 2004; Milne and Adler 1999; Weber 1990). Content analysis is an appropriate and established instrument for this. “Content analysis is a research method that uses a set of procedures to make valid inferences from text” (Weber 1990, 9). Using this method, text is scored according to a previously defined coding scheme, and is later aggregated into an overall score (Boyatzis 1998). The textual data can be then analyzed using statistical techniques in a systematic, objective, and reliable way (Krippendorff 2004). Content analysis can be achieved through either a computer-based approach (statistical or dictionary-based), or through human coding. Prior studies often used the human-coded approach; however, nowadays, the computer-based approach is gaining in popularity (Li 2010).

Another way to proxy for disclosure is to measure the number of words, sentences, rows, or pages containing the relevant information in the disclosure vehicle. Prior research rarely uses these measures. Reporting volume is mainly used in studies addressing practitioners and is barely used in scientific papers. Appendix 1a gives an overview of prior research (international and German) using reporting volume as a proxy for disclosure. Ewelt et al. (2009) and Ruhwedel et al. (2009) measure the quantity of risk reporting/forward-looking reporting via the number of words in the respective report. Knauer and Wömpener (2010) use the number of rows of forward-looking reports to address the volume of forward-looking reporting quantity, while the number of sentences has been used by, e.g., Aljifri and Hussainey (2007), Entwistle (1999), Williams (1999), and Celik et al. (2006).

2.2.1.1.1 Manual Data Collection and Analysis

The manual method includes the individual analysis of the unit (e.g., the annual report) by one or more researchers. However, this approach is labor-intensive and time-consuming. Each report must be read and analyzed separately by the researcher⁶, and then classified according to the predefined coding scheme, which can also take significant time. Consequently, the manual method often leads to a smaller sample size (Beattie and Thomson 2007). But the language can be complex and rich in information. If understanding the overall context and content of each sentence is important to the analysis, the manual approach is usually more suitable (Milne and Adler 1999).

2.2.1.1.2 Computer-based Data Collection and Analysis

Computer-based approaches are classified as either dictionary-based or statistical. The first technique uses software programs to classify words or sentences based on a prespecified list of items. But in most computer-based studies, a manual component is still inherent (e.g., the creation of a keyword list). The second

⁶ The researcher conducting the content analysis is also called the *coder*, as he is classifying text according to the predefined coding scheme.

technique is based on the individual programming of a statistical software product. In the accounting field, the dictionary-based approach is used more often, because the statistical method requires a sophisticated level of programming and informatics knowledge (Li 2010). Appendix 1b gives an overview of prior research using the computer-based methods.

2.2.1.1.2.1 Dictionary-Based Approach

Bontis (2003) analyzes intellectual capital disclosures via an electronic database. He creates a list which was comprised of thirty-nine keywords related to intellectual capital. These keywords are searched electronically in all the annual reports in the database. He analyzed 10,000 annual reports, getting seventy-four hits for intellectual capital keywords. Only seven of the thirty-nine intellectual capital terms were identified.

Beattie et al. (2004) and Hussainey et al. (2003) use the text analysis software *Nudist* in their analysis, Hussainey et al. (2003) as their primary method, and Beattie et al. (2004) for assistance.

Hussainey et al. (2003) use several different approaches to analyze the narratives in annual reports, with an emphasis on forward-looking information. Their first step is to create a list of prospectus-type keywords, which *Nudist* then searches for in the annual reports. Their second step is to identify relevant topics in the forecasting process by analyzing analyst reports. Then, similarly as in step one, a list of key words is identified and *Nudist* searches for these words in analyst reports. Their third step is to have the researcher identify the main topic of each analyzed forward-looking sentence. Because the list of different topics in these sentences was quite long, Hussainey et al. (2003) narrowed down the list, which then mainly contains profit-related topics. Afterward, the annual reports are analyzed based on the wider list and the narrower topic list derived from the analyst reports. Thus, *Nudist* searches for both the number of sentences containing forward-looking information, and the number of sentences containing the relevant topic. The sentences that include both types of information serve as the basis for

the disclosure index. To justify their research method, Hussainey et al. (2003) choose fifty annual reports and analyze them manually. They compare their results to those obtained by *Nudist*. They find that 85.5% of the sentences are classified correctly by *Nudist*, which is quite high compared to other studies which will be mentioned later in this section.

Beattie et al. (2004) analyze voluntary disclosures from Cadbury Schweppes plc's⁷ 1999 annual report, using *Nudist* to assist in the analysis. As noted earlier, they develop a coding scheme that analyzes sentences according to four attributes: 1) time orientation (e.g., historical, forward-looking, non-time-specific), 2) financial or non-financial, 3) quantitative or non-quantitative, and 4) topic-related. As described earlier, an electronic version of the annual reports is input into *Nudist*, which splits the text units. Based on those splits, the coding is then conducted manually off-screen, and transferred to *Nudist*. The software ultimately serves as a type of analysis tool. *Nudist* lists the different categories and how often the disclosed information refers to the categories.

Beattie and Thomson (2007) compare the electronic and manual approaches for the analysis of intellectual capital terms within Next plc's 2004 annual report. They obtain a list of 105 intellectual capital terms. The manual approach leads to 906 hits on intellectual capital items; the electronic approach finds only 264 hits. These results suggest that the word search approach may be capturing as little as 29% of the relevant information compared to the manual approach, and implies the superiority of the manual approach.

Kothari et al. (2009) use disclosure text from corporations, analysts, and the business press from 889 companies over six years on a quarterly basis, obtaining 326,357 texts to analyze. In their first step, they manually classify each disclosed

⁷ Beattie et al. (2004) additionally analyze ten other firms from the same sector as a basis for comparison.

text unit according to six content categories.⁵ Afterward, they use the software *General Inquirer (GI)*⁸ in the analysis process. This software both counts words and matches the words with dictionary-supplied categories. Kothari et al. (2009) use the categories “positive” and “negative” from the dictionary as they distinguish between favorable and unfavorable disclosures in their analysis. Thus, thousands of words with negative and positive connotations are provided by the dictionary. The disclosed text is compared with those words for classification purposes. On that basis, they calculate the score for the positive and negative classifications for each firm by quarter and by topic, which is then used in their further analysis.

Obviously, as shown by the studies summarized before, one advantage of the dictionary-based approach is that it is capable of analyzing and coding a large number of reports compared to the more labor-intensive manual approach. Additionally, it is a fairly simple way to categorize words. Another advantage is replicability of results, if a common software is used (Hussainey et al. 2003). But text contains plenty of information. The richness and complexity often cannot be captured adequately by word-counting software programs. For example, the dictionary-based approach may not capture all the synonyms or multiple meanings of a particular word. Furthermore, by analyzing only the words, context and settings can be lost (Neuendorf 2002; Weber 1990). For example, the word “increase” can have a positive meaning in a revenue context, or a negative meaning in a cost context. Sentences can also have a negative tone, even though the actual words may have generally positive connotations. Some dictionary software cannot distinguish between positive and negative meanings (Li 2010). Prior research has shown that the dictionary-based approach is especially prone to

⁵ The different categories are: business environment, strategy, operations, human resources, and two other categories not named explicitly in the paper.

⁸ The version of *GI* used in Kothari et al. (2009) is only for the English language.

several problems outlined before, and tends to return lower success rates⁹ than the manual or statistical approach (for the detailed results of the different methods, see 2.2.1.1.2.2).

2.2.1.1.2.2 Statistical Approach

The problems of the dictionary-based approach can be partially solved by statistical approaches.

Li (2010) uses a complex *naïve Bayesian machine learning algorithm*¹⁰ to classify the disclosure tone and content of forward-looking information provided in 10-K and 10-Q filings. He analyzes sentences extracted from the MD&A containing forward-looking information. The sentences need not be contiguous, because Li (2010) focuses on sentence level and thus overall context is less important. However, before the algorithm can work properly, a certain amount of training must be performed. For this purpose, about 30,000 sentences are coded manually for the categories tone (four different categories, e.g., positive/negative) and content (twelve different categories).¹¹ After the manual coding, the *Bayesian machine* is fed the data in order for it to learn to classify each sentence. Subsequently, the algorithm can perform the coding process independently. It is thus possible for Li (2010) to analyze 13 million sentences according to disclosure tone and content. To validate his results, Li (2010) uses an N-fold cross-validation method,¹² and finds a 67% success rate for disclosure tone, and 63% for disclosure content. Additionally, for disclosure tone, he compares the dictionary-

⁹ For the calculation of the success rate, the manual approach is taken as benchmark.

¹⁰ Creating Bayesian networks is a strategy widely used in order to display and calculate probabilities in a scenario of uncertainty. The theoretical model is strongly based on probability theory and can hence deduce probabilities of future events based on a set of events recorded. Bayes networks find application in various fields, such as computational biology, medicine or decision support systems.

¹¹ Note that sentences can be assigned to more than one category.

¹² This validation method uses an N between 3 and 50, meaning that the sample is split accordingly to the size of N. So for an N of 3, the sample of 30,000 sentences would be split into three samples of 10,000 sentences. One part (10,000 sentences) serves as the training data for the other two parts. The success rate for the tests is then calculated and documented.

based approach for different software programs to the manual analysis of the 30,000 sentences of the training process. The dictionary-based approach returns poor results, with only a 40% success rate for the *Linguistic Inquiry and Word Count (LIWC)* software, a 33% success rate for the *General Inquirer (GI)* software, and 49% for the *Diction* software, compared to the manual approach as a benchmark. Thus, all three programs have a lower success rate than the statistical approach with 67%.

Huang et al. (2010) use the same approach as Li (2010). They analyze the tone of 27,231,727 sentences from 488,494¹³ analyst reports. For the training data, they use 10,000 randomly selected sentences, coded manually by three researchers. To test for validity, they also use the N-fold cross-validation method, and obtain a 77% success rate. Additionally, they compare their method to *LIWC*, *GI*, and *Diction*, which have success rates of 52%, 48%, and 55%, respectively, to demonstrate the superiority of the statistical method. The success rates for the dictionary approaches and for the *Bayesian machine* are higher than for Li's (2010) study.

Grüning (2011) uses an *Artificial Intelligence Measurement of Disclosure (AIMD)* to analyze annual reports. This method also goes beyond the aforementioned dictionary-based methods, and has the added advantage that little human interaction is required. Grüning (2011) defines ten disclosure dimensions¹⁴ based on the content of the information in the reports. The program analyzes sentences and quantifies the information that refers to the defined dimensions. However, note that distinguishing between mandatory and voluntary disclosures within the annual reports is not possible. Similarly to Li's (2010) approach, in Grüning's (2011) first step, a training phase is required, based on a coding scheme and manual coding. Afterward, the program has learned from the first phase, and

¹³ For their final analysis only 389,096 reports could be used.

¹⁴ Examples of the dimensions are i.a. financial information, employee-related information, and capital market-related information.

can apply the knowledge to a larger sample. Analyzing all the reports, information is classified along the predefined ten dimensions, and an overall score is also calculated. To provide evidence for the validity of the index, Grüning (2011) correlates his overall index with others, and shows strong and highly significant correlations. However, Grüning (2011) does not compare his computer-based method with a manual approach and his sample is quite small, consisting of only 348 to 361 firms.

In summary, the statistical method is generally less labor-intensive and more useful for larger samples than the manual approach. Prior research has shown that the statistical approach tends to have higher success rates than the dictionary-based approach. But, the development of statistical programs and algorithms is difficult and demands a superior level of programming.

Apart from these disadvantages, however, the statistical methods offer excellent potential for the future. They are expected to become developed and individualized more fully in order to facilitate the analysis of content, and to obtain more stable results and higher success rates.

2.2.1.2 Weighting versus Non-Weighting

As I mentioned briefly earlier, disclosure indices can be unweighted or weighted. Weighting is done to reflect the importance of each item. The first method has been used more frequently in prior studies, which have assumed that each item is equally important¹⁵. Binary coding is thus used, where the absence of an item is recorded as 0, and the presence is recorded as 1 (Cooke 1992; Meek et al. 1995). Beretta and Bozzolan (2008) state that “unweighted indices [...] can only measure the quantity of disclosure” (p. 337). I do not fully agree with this statement, however. I find that using an unweighted index addresses the scope of the reporting more than the quantity. But using weighted indices allows for the possibility of many different scenarios, as described in more detail next.

¹⁵ As weighted indices are not used very often, Appendix 1c gives a tabulated overview of weighted indices.

First, scores can be weighted according to the degree of disclosure. One method is to consider *ex ante* reporting accuracy.¹⁶ Botosan (1997) weights quantitative information more heavily “because precise information is more useful and may enhance management's reporting reputation and credibility” (p. 334). Forecast precision is especially important, because vague announcements may lead to less accurate valuations by investors. As Choi et al. (2010) note, the more precise the forecast, the better the user can process the data. Prior literature has used several different methods of scoring. Some studies use a score ranging from 0 (for non-disclosure) to 4 (for a point estimate) to measure forecast precision (Bozzolan and Mazzola 2007; Wasser 1976). Another method is using a three-point scale, where 1 equals no disclosure, 2 is for limited disclosure, and 3 is for extensive disclosure (Robb et al. 2001).

Second, prior research has conducted surveys among different user groups such as financial analysts, private investors, or auditors to learn about individual relative ratings of the importance of different items (Naser and Nuseibeh 2003; Oberdörster 2009; Singhvi and Desai 1971; Stanga 1976). Incorporating the opinion of one or several stakeholder(s) in turn leads to a weighting of the reported items with the results of the survey. The problem with this approach, however, is that different user groups naturally assign different weights. This can lead to distortions, because the studies are based mostly on subjective opinions and consider the opinion of a subset (Cooke 1992; Raffournier 1995). I note that some research does aim to address only one class of users, and in this case surveying only one group of stakeholders would be appropriate (Buzby 1975). Another common problem with surveys is that respondents do not usually have any economic stake in their answers. This can lead to distortions, and could affect the results (Chow and Wong-Boren 1987).

¹⁶ *Ex ante* reporting accuracy corresponds to the precision of the forecasts in the annual reports. In contrast, *ex post* reporting accuracy refers to the *ex post* approval if the predicted numbers are fulfilled.

Third, using a combination of the first two approaches is also possible. Coy et al. (1993) classify the differences in reporting quality on a three-point scale as poor (1), satisfactory (2), and excellent (3). They use a similar scale for item importance, ranging again from 1 for low, 2 for medium, and 3 for high.

Choosing the most correct weighting approach is difficult. Most studies use either weighted or unweighted indices, but some combine both. It is interesting to note that most studies also do not find any differences between the two approaches. Prencipe (2004) asked financial analysts to assess the importance of each item of their disclosure index on segment disclosure. The final weight for each item was measured by the mean of all individual scores. The weighted and unweighted disclosure scores were used as the dependent variables in the regression models to determine the influencing factors of segment disclosure. The results show no differences attributable to index usage. Chow and Wong-Boren (1987) also use both weighted and unweighted indices. The weighting is the result of a survey of bank officers. The authors also find no difference between the indices. The same is true for Robbins and Austin (1986), who also used two different indices and found no differences.

In contrast, Naser and Nuseibeh (2003) come to a different conclusion in their descriptive analysis. Their sample was comprised of seven user groups, who weighted the items of the index according to their importance. Comparing the weighted (by mean and median opinions of the user groups) with the unweighted indices, they found significant differences. However, their study faces some limitations. First, the analysis is conducted for only a small sample size ($N = 67$); second, it concentrates only on Saudi Arabia, a relatively small and not representative region. Third, the data is analyzed descriptively, but not empirically as other studies mentioned here.

In section 2.3, I also construct an index that is weighted and unweighted according to the degree of ex ante precision. I present and analyze the descriptive

results. Sections 3.5 and 4.6 also explore the consequences of index construction on the empirical results.

2.2.1.3 Limitations

Self-constructed indices certainly face some limitations. One problem is the reproducibility of the results (Beyer et al. 2010). The coding schemes are often provided in appendices, but most studies give only a superficial idea of how the scoring was done. The aim of the coding scheme should be to provide a framework that will guarantee as much objectivity as possible. So if the scoring of most indices is somehow dependent on the researchers' judgments, it is not likely to be easily replicable (Healy and Palepu 2001).

Furthermore, the construction of the score is always subject to a certain amount of subjectivity on the part of the researcher (Marston and Shrikes 1991). For example, Coy et al.'s (1993) scoring system offers definitions of poor, satisfactory, and excellent disclosures, as well as definitions of importance for each item, all of which might be defined differently by other researchers. Moreover, research results on disclosure indices tend to have only limited generalizability. The research design of the index influences the results. Bravo et al. (2009) use different indices and rank the companies according to their disclosure scores. The results show that the ranking varies depending on the index used.

Mandatory and voluntary disclosure can be difficult to delineate. Heitzman et al. (2010) show that in many cases there is a threshold of materiality. The case of mandatory disclosure is given only when the disclosed information is material. Furthermore, prior studies have often classified mandatory information as voluntary (e.g., MD&As are mandatory, but the disclosure requirements are rather loose). The materiality threshold and the level of disclosure vary across firms. Thus, many prior studies (e.g. Cooke and Wallace 1989; Inchausti 1997; Prencipe 2004; Singhvi and Desai 1971) capture mandatory and voluntary information in

their indices, but do not address the materiality aspect adequately (Marston and Shrives 1991).

Obtaining a clear distinction between quality and quantity is also problematic. In prior research, indices often measure “the extent of disclosure but not necessarily the quality of the disclosure” (Marston and Shrives 1991, 195). Thus, quantity measures are often misleadingly used to proxy for quality (Beretta and Bozzolan 2008).

2.2.1.4 Validity and Reliability

Content analysis faces the problem of subjectivity in the coding process. But precautions and measures can be used to guarantee higher levels of objectivity, validity, and reliability (Spens and Kovacs 2006).

Validity and reliability are important constructs in content analysis because it is assumed that replicable and valid inferences will be drawn from the text (Krippendorff 2004; Weber 1990). A study is *reliable* when the research results can confidently be replicated by other researchers. It is *valid* when the measuring instrument actually measures what its user intends (Krippendorff 2004).

2.2.1.4.1 Reliability

In content analysis studies, *reliability* is extremely important to guarantee correctness. Krippendorff (2004) distinguishes among three types of reliability: stability (e.g., coding data in the same way over time), reproducibility/intercoder reliability (e.g., ensuring that multiple coders will code the same data the same way), and accuracy (e.g., comparing the results obtained with a predefined standard) (Krippendorff 2004).

*Stability*¹⁷ is achieved when the results of the analysis remain unchanged over time. Thus, the stability of the coding can be proven by testing and retesting the coding. If the coder can obtain the same result without major deviations by coding

¹⁷ Common synonyms for stability are intra-coder reliability and consistency.

the unit again at a later date, stability can be guaranteed (Krippendorff 2004; Milne and Adler 1999). Intra-observer reliability is considered the weakest form of reliability, as only one coder is used in the process.

Reproducibility is achieved when the results can be reproduced by other coders under varying circumstances and locations (Krippendorff 2004). To assess reproducibility, a test-retest situation is created. To guarantee reproducibility, several methods can be used, depending on the number of coders. If there is more than one coder, reproducibility can be tested using inter-coder reliability (the proportion of agreement among multiple independent¹⁸ coders). A low discrepancy would imply a high level of reproducibility.

Another possible measure is an agreement ratio, which compares the agreement of two coders with the total number of judgments (Milne and Adler 1999). Several other measures used frequently in prior research are Krippendorff's alpha, Scott's pi, and Cohen's kappa. But there is no general rule about which measure to use in any particular situation.

Because of financial and/or time restrictions, many studies use only one researcher to conduct the content analysis. However, because inter-coder reliability cannot be tested, other precautions should be taken to ensure a high degree of reproducibility, as Milne and Adler (1999) suggest. To achieve a reproducible coding, it would make sense to implement a process that could specify, pretest, and then respecify the coding scheme while it is being developed. Involving a second researcher in the same field (Milne and Adler 1999) could also be helpful. The second person could assist in developing the coding scheme and the pretest, and provide advice if the classification of any information is unclear. Furthermore, it makes sense to include others with coding experience for solving discrepancies between the first and second researchers.

¹⁸ In some studies, the degree of independence of the coder is not obtained, because the coders communicate with each other. This can influence the results, and can lead to a higher degree of agreement (Krippendorff 2004).

Other precautions are equally important, such as clear descriptions about coder qualifications to ensure adequate coding. The coding scheme must also be as clear and transparent as possible, with all abbreviations, definitions, and scorings thoroughly spelled out. And rules about how to conduct the coding must also be fully developed. Well specified decision rules and categories make it easier to justify using only one coder (Guthrie et al. 2004). One advantage of having one coder is that inter-personnel interpretation differences are eliminated (Pechtl 2000). It may also be easier to provide intensive training for the coder before the process begins.

In addition, to ensure reproducibility, it is necessary that the coders have the cognitive abilities and the appropriate background to adequately conduct such a study (Krippendorff 2004). For example, they should have prior research experience, or extensive background knowledge in the respective field.

Accuracy is the degree to which the research corresponds to a predetermined standard or norm (Krippendorff 2004; Weber 1990). The coding must be tested against an existing standard, and the higher the compliance, the higher the degree of accuracy. Accuracy is the strongest measure of reliability, but accuracy measures are rarely applied in research because the existence of standard coding for texts is so rare (Weber 1990). Consequently, accuracy often cannot be considered or tested adequately.

2.2.1.4.2 Validity

Validity can be distinguished either internally or externally. External validity addresses the question of whether the obtained results are generalizable, implying, for example, the extrapolation of the results to other times or settings. Internal validity is achieved when the definition of the measure corresponds with its operationalization (Neuendorf 2002).

Most prior disclosure studies have not captured the validity aspect in depth, and many lack it completely. I next discuss the core concepts of validity, both internal (face validity) and external (empirical, content, and construct validity),

and I illustrate how to adequately address this question in research (Krippendorff 2004; Weber 1990).

Face validity (internal validity) is guaranteed when the construct measures what it appears to measure (Neuendorf 2002). This, however, is the weakest form of validity. It implies that the measure is so obvious that anyone with common sense would agree. Krippendorff (2004) describes face validity as accepting “research findings because they make sense [...] usually without having to give or expecting to hear detailed reasons” (p. 313). For example, in some cases, it is obvious and more correct to use a manual approach in order to achieve a higher level of validity (Krippendorff 2004; Sonpar and Golden-Biddle 2008).

Empirical (hypothesis) validity is achieved when established literature and theories support the research results (Boyatzis 1998; Krippendorff 2004; Weber 1990). Basing category classification and item definition on prior research and theoretical frameworks is likely to lead to a high degree of empirical validity. For example, a higher level of disclosure (measured by a disclosure index based on content analysis) should lead to lower information asymmetries, because the higher level of disclosure should lower any principal-agent discrepancies.

Content validity is achieved when all the features that define the concept are measured “with the goal of covering all important parts of the construct” (Neuendorf 2002, 117). Thus, it makes sense to base the index construction on approved, prevailing, and relevant theoretical frameworks and prior research, in order to obtain the most valid and comprehensive index (Krippendorff 2004).

Most studies base their coding schemes and item selection at least somewhat on the theoretical foundation of earlier studies. However, many of these studies do not explicitly address the choice of the frameworks as a measure of validity. One way to achieve content validity is to fine-tune the categories after the coding schedule has been developed. Ideally a pretest could be conducted, using more than one coder. The results and problems could be analyzed, and any discrepancies between coders could be discussed and examined thoroughly. Any

adjustments or refinements to the coding schedule made in this manner are likely to be sufficient. Experts in each respective field could also be consulted to guarantee that all relevant items are included (Rourke and Anderson 2004; Spens and Kovacs 2006).

Construct validity is achieved when the measure is correlated with another measure of the same construct in order to ensure the results are generalizable (Krippendorff 2004; Weber 1990). This implies that the same or very similar results are obtained when applying a different research method for the same question and hypotheses (Holsti 1969). Higher correlations between different methods imply better construct validity. However, it is rare to find a different research method that has already been applied for the same research question (Neuendorf 2002). Thus, construct validity has not been fully addressed in prior research thus far.

2.2.1.4.3 Reliability and Validity in Prior Research

In the field of accounting, only a few studies have addressed reliability and validity while using content analysis research methods. In Appendix 1d I illustrate selected studies explicitly addressing validity and/or reliability aspects in a comprehensive way.

One example is Beretta and Bozzolan (2008), who illustrate both validity and reliability for their self-constructed index. They measure reliability using Krippendorff's alpha, and obtain a satisfactory value that is above the acceptable level of 0.75 proposed by prior research (Milne and Adler 1999).

Validity is measured by comparing the quantity measure with the overall quality index. The results show no correlation between the two scores, indicating that each index measures something different. An additional validity measure is the significant relationship between the disclosure quality index and the properties of analyst earnings forecasts, which confirm empirical validity.

Beattie et al. (2004) validate their disclosure score by basing it on prior research and frameworks. They also calculate Scott's pi as a measure of reliability, and obtain highly satisfactory results.

Mohd Ghazali and Weetman (2006) use a second coder, but they do not calculate any of the reliability measures discussed in section 2.2.1.4.1. Instead, for discrepancies between two coders, they consult a third person to resolve the differences.

Most prior research, however, has not used validity and reliability measures in any meaningful way. Future research may want to focus on these measures in order to justify index construction.

2.2.2 Existing Indices

Existing indices are established and publicly available for research purposes. In the following I illustrate one of the most popular existing indices of the U.S. and two existing indices from German speaking countries. In the U.S., the AIMR or FAF index¹⁹ is often used as the disclosure proxy in prior research. Until fiscal year 1995, the Association for Investment Management and Research (AIMR)/Financial Analysts Federation Corporate Information Committee (FAF) published an index each year that used financial analysts to assess companies' disclosure quality. The analysis included approximately 500 firms from 27 different industries. Disclosure was rated in three categories: annual reports, quarterly and other published information, and investor communication. An overall index that aggregated the three measures was also provided.

The AIMR/FAF reports are comprised of quantifiable and non-quantifiable information. However, Healy and Palepu (2001) note several disadvantages of this index. First, they believe the firm selection procedure is not transparent enough. Second, they have questioned how seriously the analysts take the ratings. But one

¹⁹ The FAF merged with the Institute of Chartered Financial Analysts (ICFA) in 1989 to form the AIMR. From 1990 onward, the disclosure practices were published by the AIMR, but were prepared by a committee of the FAF.

advantage is that there is a high comparability of results among studies that incorporate that index. Beattie et al. (2004) classify this type of index as subjective, because analysts rank the companies according to their information disclosure quality, and the rankings are thus based on analyst perceptions. Appendix 1e gives an overview of prior disclosure research using the AIMR/FAF index.

In Germany, the *Best Annual Report*²⁰ competition provides an annual disclosure score for annual reports based on content (60%), linguistics (20%), and creativity (20%). The content section alone considers more than 330 relevant items. The overall assessment of this section consists of the annual report itself (80%), and the interim Q3 report (20%). The forward-looking report comprises one section of the analysis, and involves approximately eighteen items.²¹ Some results of the *Best Annual Report* competition are also available online. Upon request, the team responsible for preparing it may be able to provide the scores for all firms.^{22 23}

²⁰ The *Best Annual Report* competition is carried out once a year, and is conducted by Prof. Baetge and his team from the University of Münster and *Manager Magazin*.

²¹ For more information about the *Best Annual Report*, see (Baetge et al. 2010), or: <http://www.baetge-analyse.de/leistungen/geschaeftsberichte/der-beste-geschaeftsbericht.html> and <http://www.manager-magazin.de/unternehmen/artikel/0,2828,783491,00.html>

²² The score of the *Best Annual Report* has been used in, e.g., (Baetge et al. 2010; Häußler 2008; Oberdörster 2009).

²³ Another index from a German speaking country is from Switzerland. The Institute of Banking and Finance provides an annual disclosure score, referred to as the Annual Value Reporting Rating. This scoring has nine categories, with a total of thirty-five items. A scale ranging from 1 (no disclosure) to 6 (very high information disclosure) is used to measure the information content given in the annual report. The content of each item is then weighted between 1 and 6 according to importance. For 2010, 232 firms were included, with the rating results publicly available on the Internet.

2.3 Constructing an Index for Forward-Looking Reports

2.3.1 Institutional Background

2.3.1.1 Regulations

Forward-looking reporting has a long tradition in Germany, and over time has been subject to numerous regulatory changes that have affected its contents and precision. In 2005 the Reform Act on Accounting Regulations (BilReG) led to an amendment of management and forward-looking reporting. Within the first three months of the financial year, all large and medium-sized companies are required to prepare a management report for the previous year (in addition to the annual financial statements) (German Commercial Code (GCC), section 264 [1]). The same is true for the group management report, which must be reported for the previous year within the first five months after the fiscal year-end (GCC, section 290 [1]).

Companies reporting under IFRS are also required to prepare management reports in accordance with the GCC. Forward-looking information has been a mandatory component of the management report since 2005 (Krawitz and Hartmann 2006). The precise contents of management reporting are regulated by the GCC's sections 289 and section 315 for groups of companies. For future-oriented information, the GCC s. 315 [1] states that a company must assess and discuss the expected development of the group, as well as the underlying assumptions about its significant risks and opportunities.

Forward-looking reports provide information about all kinds of forecasts and company prospects. Compared to management forecasts, however, the focus is not only on earnings, such as those issued in press releases. The richness and scope go far beyond that, as the information is much more holistic, and thus concentrates on many different facets of the firm's possible future.

In addition to the minimum disclosure requirements mentioned in the GCC, further information about forward-looking reports was not required by law. However, the German Accounting Standards Board (GASB) amended this

regulation and issued recommendations and a framework for presenting management and forward-looking reports in German Accounting Standard (GAS) No. 15, “Management Reporting”.²⁴ However, GAS 15, as with all GAS, is only a recommendation, and is not legally binding. GAS 15 requires firms to disclose expected developments over the coming two years. For complex cases, longer forward-looking periods are recommended (GAS 15.86).

In addition to future trends, management expectations, influencing factors, significant assumptions, and uncertainties (GAS 15.84-88), expectations about future operational and financial results should also be mentioned (GAS 15.88). Finally, management must draw an overall conclusion (GAS 15.84) for the coming year’s prospects. A supplement to GAS 15 provides further recommendations about the possible contents.

As a way to deal with the worldwide economic crisis, the GASB issued advice at the end of March 2009 in the “Report on Expected Developments” to illustrate how to report on expected developments during times of economic instability. They noted the constraints on reliable forecasts, but did not choose to waive the requirement to provide forecasts.

Furthermore, to comply with the German Accounting Law Modernization Act²⁵ (BilMoG), the GASB decided to revise GAS 15. In *Phase I*, the Accounting Standards Committee of Germany (ASCG) issued a revised version in September 2009, which was ultimately adopted in January 2010. GAS 15.90 states that forward-looking reports should not be dropped entirely during times of financial uncertainty, but they can be less precise than during normal situations. However, it is important to continue to provide information about operational results, financial positions, and net assets. In *Phase II* of the project, a task force was formed, and began to work toward fundamentally revising GAS 15 in April 2010.

²⁴ The aim of GAS 15 is to specify the Reform Act on Accounting Regulations by considering international developments (Buchheim and Beiersdorf 2005).

²⁵ BilMoG (Bilanzrechtsmodernisierungsgesetz).

In December 2011, the draft GAS 27 “Group Management Reporting” was released, considering the current developments as well as practical experience from the past. The new regulation combines the current GAS 15 (Management Commentary) and GAS 5 (Risk Reporting). Comments on the draft can be submitted to GASB until April 2012.

The management report and the forward-looking report are audited according to the GCC s. 316, which leads to an increased credibility of the reported information (Healy and Palepu 2001).

2.3.1.2 Lack of a “Safe Harbor” Rule

“Safe harbor” rules do not exist in Germany, and management is not indemnified against a liability by law for releasing firm prospect information, as they would be in other countries such as the U.S. For example, U.S. firms must publish a “management discussion and analysis of financial conditions and results of operations” (MD&A) (§229.303). The report must contain a prospective analysis of future developments if the influence on financial positions and performance is substantial. However, “any forward-looking information supplied is expressly covered by the safe harbor rule for projections” (Regulation S-K Item 303, Instructions to paragraph 303 (a) #7). This rule protects the company from liability, provided it acted in good faith (Dobler 2008; Rieckhoff 2009).

However, the lack of such a rule in Germany does not imply imminent lawsuits for providing erroneous forecasts. There is actually no specific rule dealing with erroneous forecast releases, but there may be an appeal to GCC s. 823 [2] in combination with s. 331[1] sent. 1. According to that paragraph, a tort liability is only possible if management intended to release erroneous forecasts. Proving that the act was deliberate is quite challenging and may be impossible. Thus, it is rather uncommon to sue management in Germany. The lack of litigation risk for firms and their management gives rise to variation in reporting quality among German firms (Fleischer 2006; Rieckhoff 2009).

2.3.1.3 Enforcement

The task of the Financial Reporting Enforcement Panel (FREP) is to evaluate the overall financial reporting quality of listed companies on the regulated market in Germany. The group management reporting, including risk reporting and reporting on expected developments was examined in the last few years by the FREP and is again one of the areas of emphasis in 2012. The panel reported a number of inadequate reporting within management reports relating to forecast information in the last years. The number of errors in forward-looking reports increased considerably in 2008 compared with previous years. During the financial crisis there were deliberate instances of omission of future orientated information (FREP 2009). An example for a different reporting behavior in the annual report of 2008 is Merck AG. They provided a forward-looking report, but without any forecasts or qualitative statements concerning its future with the following explanation: “These special circumstances make it impossible for us to give any quantitative forecasts. Likewise, qualitative statements concerning trends are – in view of the strong dynamics and limited soundness of such estimates – at the present time not compatible with the planning horizon provided for in this management report” (Merck 2008, 64).

The German Federal Financial Supervisory Authority (*Bundesanstalt für Finanzdienstleistungsaufsicht—BaFin*²⁶) as well as the Higher Regional Court confirmed this error and demanded the publication of the error in the electronic German Federal Gazette from Merck (Gödel 2010; OLG Frankfurt/M. 2009).

2.3.2 Sample

I carry out my study for the years 2005 through 2009, based on the BilReG regulations. My sample consists of 160 companies listed in the German Prime Standard as of the end of May 2009. As illustrated in Table 1, the sample contains

²⁶ BaFin is an independent public-law institution, and is subject to the legal and technical oversight of the Federal Ministry of Finance.

companies listed on the HDAX (including the DAX, the MDAX, and the TecDAX), and the SDAX. These companies are chosen because they represent large firms in their respective fields. Because of differences in reporting of forward-looking information, I exclude financial and insurance institutions from the study to improve comparability. I also exclude insolvent firms, as well as firms with missing reports for my sample time period. Furthermore, I exclude one company with a fiscal year-end in June, because I was unable to assign it to only one reporting period. This leads to a possible sample of 123 companies, with 615 firm-year observations over a period of 5 years.

	Companies	Firm years
DAX companies	30	150
MDAX companies	50	250
TecDAX companies	30	150
SDAX companies	50	250
Data base I	160	800
Financial and insurance institutions	-24	-115
Restructuring or insolvent etc.	-5	-25
Fiscal year end 30.06.	-1	-5
Missing reports	-7	-35
Data base II	123	615
Reduction due to fiscal year 2004/2005	0	-11
IPO in 2006 or 2007 or 2008	0	-24
Reduction due to change of reporting period	0	-1
Total Sample	123	579

Table 1: Sample

I also assign companies that report on a non-calendar fiscal year to the calendar year in which most of the reporting period would apply. Thus, for eleven firms, the 2004/2005 annual reporting period is most applicable for 2005. However, because BilReG was not applicable in 2004, I exclude these eleven firm years. I am thus able to ensure that all companies apply the 1.1.2005 rules. Further reductions of my sample occur because of IPOs that took place in 2006, 2007, and 2008, and because of a change in reporting period by one firm. My final sample is comprised of 123 companies with 579 firm-year observations (unbalanced panel).

2.3.3 Index Construction

I construct a disclosure index for my reporting vehicle, the forward-looking report. Figure 3 illustrates the decisions during the construction process. The direction is highlighted in dark grey.

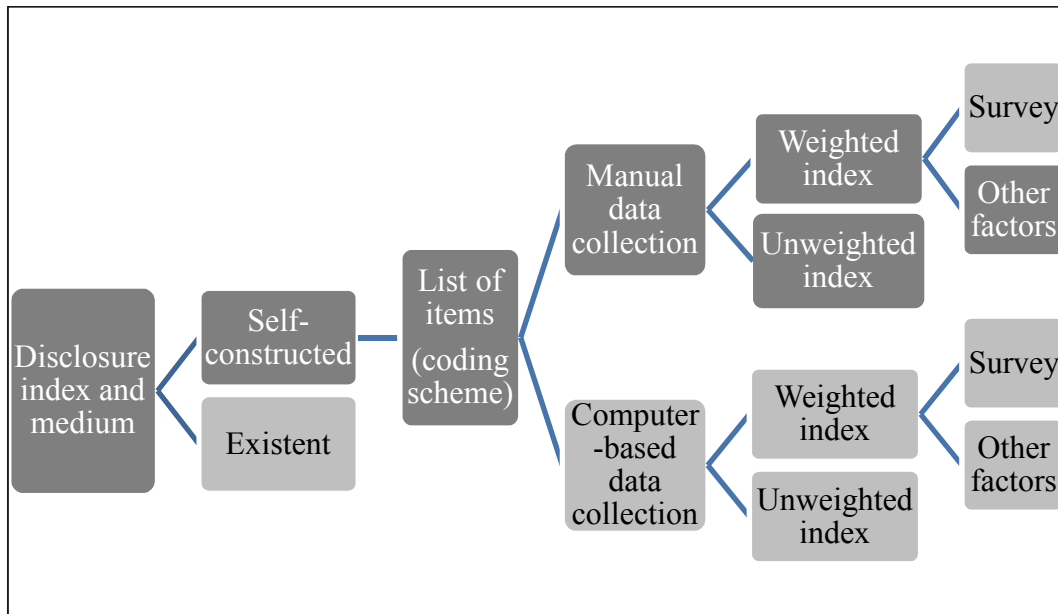


Figure 3: Self-Construction of a Disclosure Index

As discussed at the beginning of this study, the first choice in the research process is the decision for the disclosure index and for the disclosure medium being examined. In my case, as described in chapter 2.3.1, I use the forward-looking report as medium.

My second step is to decide whether to use an existing index or a self-constructed index. For an existing index, Germany, as noted earlier, has the *Best Annual Report* index, which is calculated annually. However, the index for the forward-looking section is not detailed enough for my purposes. Barth (2009) and Barth and Beyhs (2010) construct an index that addresses the scope of forward-looking reporting. However, this index is not widely accepted and established, and also not publicly available. Furthermore, these studies emphasize environmental forecasts much more strongly than I intend to do here. Because there is no other

established quality index for forward-looking reports for the German market, I believe developing and self-constructing my own is most suitable.

My third step is to choose the list of items. It is important to choose a coding scheme that is objective and is based on theoretical aspects. The development of the coding scheme results from the GCC, the basis of regulation, and from GAS 15, which contains specific recommendations for German forward-looking reporting. The items come from a thorough literature analysis of prior disclosure index studies (Barth, 2009; studies based on the *Best Annual Report*) and accounting annotations (Ellrott 2006; Kirsch and Köhrmann 2007; Lange 2008; Oetker 2011). These provide a broad view of the interests and needs of different user groups. I also consult several checklists from different authors (Farr 2006; Niemann 2008; Tesch and Wißmann 2009) and audit companies. By using different theoretical frameworks, guidelines, checklists, studies, and recommendations to construct my index, I thus aim to reduce any subjectivity in the item selection process.

My fourth step is the decision to collect the data manually or to use a computer-based method. For my purposes, not only the word analysis but also the overall context plays an important role, so the dictionary-based approach is neither sufficient nor applicable. Using the human-coded approach, however, is labor-intensive, and thus only small samples will be feasible. Nevertheless, because of the complexity of the coding, and considering the forecast direction and ex ante precision in my study, I believe the human method is the most appropriate.

My intention is to compare different indices, so I use a weighted index (quality), as well as an unweighted one (scope). The coding schedule for both indices thus differs slightly. For the third index, the quantity measure, no coding scheme is necessary because the index simply counts the number of words contained in each forward-looking report.

2.3.3.1 Self-Construction of Quality and Scope Indices

My quality and scope disclosure indices will concentrate on company-specific forecasts released by firms, not information gathered by other institutions.²⁷ Forecasts of company environment are considered and included as an item, but not in such detail as other studies have done (Barth 2009; Barth and Beyhs 2010). In these studies, the items of the category environment made up 43% of the overall index score.

I follow earlier approaches, and group the items into three categories: company environment, company-specific forecasts, and other disclosure items (for a detailed list, see Appendix 2. Next, I distinguish between the quality and scope indices. Their weighting is different, but they basically use the same items.

2.3.3.1.1 Quality Index

Figure 4 illustrates how the disclosed information is classified into the three categories for a disclosure quality score:

²⁷ The reason is that most numbers regarding company environment are based on forecasts of economic research institutes, and can be obtained elsewhere as well.

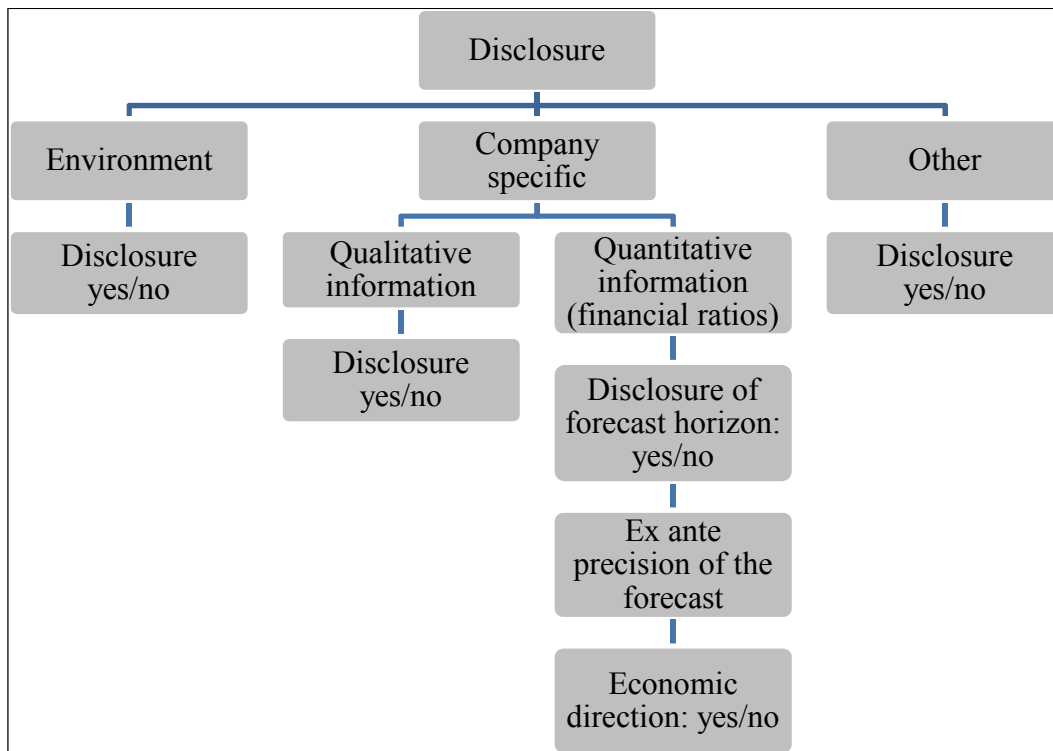


Figure 4: Disclosure Classification for the Quality Index

- The *first* category consists of expected prospects for the economy and the industry. I analyze dichotomously whether the company included such a forecast, with a score equal to 1 if a forecast was included, and 0 otherwise. This category contains two items²⁸ that can be reported by companies.
- The *second* category considers qualitative and quantitative company-specific forecasts such as, e.g., strategy, revenue, or earnings forecasts. This category consists of thirty-two different basic items:
 - I distinguish between items coded dichotomously (e.g., did the company change its operating policies? Does the company use new processes?),
 - and items such as ratios (e.g., earnings forecasts), which are coded along three different dimensions, as follows:

²⁸ For a detailed overview of the list of items, see Appendix 2. For examples from annual reports for each category, see Appendix 3.

- Forecast horizon (undisclosed, one-year, two-year, intermediate-term, long-term).²⁹
- Ex ante forecast precision (undisclosed, qualitative, comparative, minimum/maximum, vague range, bound range, point).
- Economic direction (undisclosed, positive, negative, equal) of future development.

Consequently, I then assess whether the item is disclosed, and determine the length of the forecast horizon. For all ratios, I consider forecast horizons of at least one and two years. For the most important ratios (revenues, earnings and profitability ratios), I also consider intermediate- and long-term forecast horizons.

Next, I consider forecast precision. According to the formal degree of precision, quantitative information can be classified into point, bound range, open range, minimum/maximum, comparative, and qualitative forecasts. I use the more precise distinction here, in order to differentiate more accurately between categories (see also e.g. Pellens et al. 2007).

Note that prior studies have often lumped comparative, minimum/maximum, and the vague range disclosure into one category (Bozzolan and Mazzola 2007; Morgan 2008; Wasser 1976). The coding is carried out on an ordinal basis, with 0 for non-disclosing, and 5 for a bound range forecast. The underlying assumption is that the informational value and forecast quality tend to increase with a higher degree of precision (Bozzolan and Mazzola 2007; Choi et al. 2010), with the point forecast denoting the most precise degree for item reporting. However, one disadvantage is that accuracy and reliability is assumed, but may not be reflected by reality. Forecast uncertainty should also be considered. The probability that a point forecast will be fulfilled exactly in subsequent periods is lower than the

²⁹ Intermediate-term refers to a three- to five-year forecast horizon; long-term refers to a six- to ten-year forecast horizon.

fulfillment of a bound range forecast (Choi et al. 2010), which, in contrast, is less formally precise than a point forecast.

Several recent studies conducted for the German market have assigned a higher importance to bound range forecasts, because the probability of occurrence is higher due to the range of possible outcomes (Oberdörster 2009; Prigge 2006). Prigge (2006) surveyed private investors and capital market experts, and found that both groups predict a higher use in bound range forecasts than in point forecasts. Oberdörster (2009) and Lange (2008) came to the same conclusion, the former by interviewing auditors and financial analysts. In prior German research, Wolz (2004) considers point and bound range forecasts equally important, while Krumbholz (1994) puts more weight on bound range forecasts. Because my study is conducted for the German market, I rely heavily on prior surveys and research, and weight bound range forecasts more heavily than point forecasts.

For earnings and profitability ratios, I find there are different reporting possibilities. For example, companies may report more than one earnings forecast ratio (EBIT, EBITDA, earnings, etc.) or profit forecast ratio (profit margin, equity return, etc.). Each ratio can impart valuable information to readers, so to fully capture firms' forward-looking reporting behavior, it is important to consider each additional reported earnings or profitability ratio.

Finally, I determine whether economic direction (undisclosed, positive, negative, neutral) is reported, as this can provide further indications and information. Although I can gauge direction by looking up last year's annual report numbers and comparing them to the present numbers, it is preferable and less time-consuming to include forecast direction in the forward-looking reports.

- The *third* category encompasses other items (dichotomously), such as whether an overall conclusion is given, or whether major assumptions are reported. This category is comprised of five items. To illustrate practical examples for ratio forecasts used in German forward-looking reports, Table 2 gives an overview of the different levels of ex ante forecast accuracy and economic direction.

	Without economic direction	Weights	With economic direction	Weights
Qualitative	“[...] Jungheinrich expects the overall business and earnings trend to be unfavourable in fiscal 2009.” (Jungheinrich 2008, 37)	1	n/a	
Comparative	n/a		“[...] to <u>improve</u> the key performance indicators EBITDA and EBIT during 2008” (Constantin Medien 2007, 67)	2
Minimum/Maximum	“[...] the Group wants to achieve a sustainable return on capital employed of more than 11%” (Bilfinger Berger 2005, 71)	3	“Overall, we see a very good chance of <u>boosting</u> sales [...], by over 10% in 2008” (Wacker Chemie 2007, 89)	4
Vague Range	“[...] we expect adjusted EBT in the low three-digit million euro range” (ThyssenKrupp 2008, 172)	3.5	“We project a low- to mid-single-digit sales <u>decline</u> on a currency-neutral basis [...]” (Adidas 2008, 122)	4.5
Point	“[...] the Pfleiderer Group is forecasting revenues in the order of 2 billion euros [...]” (Pfleiderer 2007, 62)	4	“[...] we also anticipate a further <u>increase</u> in the adjusted EBIT. We expect an increase to around EUR 110.0 million [...]” Demag Cranes 2007, 82)	5
Bound Range	“Group sales [...] between EUR 13 billion and EUR 14 billion” (Hochtief 2005, 81)	5	“[...] the EBITDA margin pre-exceptionals will <u>rise</u> significantly to between 9 and 10 percent [...]” (Lanxess 2005, 77)	6

Table 2: Ex Ante Forecast Precision and Economic Direction – Examples

It is important to determine why an item is undisclosed. Is it because the company does not wish to disclose it, or is it because the item is not applicable or relevant? The first option would be to construct an index with items that are relevant for all

companies (i.a. Botosan 1997). The second option is to exclude items when it is obvious they are not relevant for a particular firm (i.a. Raffournier 1995). In my study, the index is constructed so that all the chosen items are relevant for all companies.

Finally, I combine the scores from all three categories to obtain an overall score for each company and year.

2.3.3.1.2 Scope Index

Figure 5 illustrates how the disclosed information is classified into the three categories for a disclosure scope score:

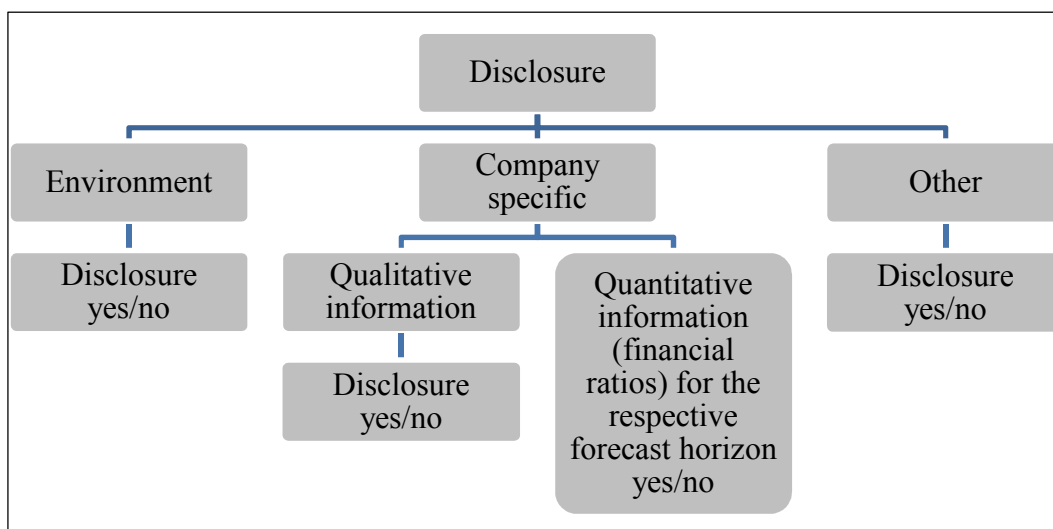


Figure 5: Disclosure Classification for the Scope Index

As mentioned before, the scope index is based on the same items as the quality index. However, in contrast to the quality score, the scope index only distinguishes between information that is present or absent by assigning dichotomous variables. The previously described weights for ex ante precision and economic direction are not relevant here; it is only important to note whether the item was reported in the forward-looking-report. The unweighted quality index is a proxy for reported scope, because it only measures the number of items disclosed.

2.3.3.2 Self-Construction of a Quantity Measure

I use quantity by measuring the total number of words in each company's forward-looking reports. Using the number of words, rather than the number of pages or sentences, is more precise because it avoids distortions from, e.g., different layouts, type sizes, etc.

2.3.4 Reliability and Validity of the Indices

2.3.4.1 Reliability

I capture the measure of *stability* by coding and recoding the annual reports. A pretest was conducted first, and the coding schedule was adapted according to the results. The main coding process took place during August and September 2009 (HDAX companies). The coding was repeated in January 2010, in order to detect any errors and resolve misunderstandings. The results were essentially the same in both cases, with only negligible differences that were adapted.³⁰

In June 2010, the coding was extended to SDAX companies. Because the coder was sufficiently experienced at that point, coding was not repeated for the entire sample. Instead, a random examination of 5% of the sample was carried out. Just as in the HDAX sample, only insignificant differences were found. Thus, my study has a high degree of stability.

I used one coder for the coding process itself. To achieve *reproducibility*, a second researcher assisted with the development of the coding scheme and the pretest. The second coder also served as a consultant when classifications were unclear. Furthermore, to ensure a clear and understandable coding schedule, I used a third person with coding experience for further advice on clarifying the schedule. The coding scheme is defined as clear and transparent as possible. The definitions, scorings and rules about how to conduct the coding are captured within the coding sheet.

³⁰ No statistical tests were conducted.

Note that, for my study, the coder needed a scientific background with a special knowledge of accounting and financial reporting. The primary coder holds a diploma in business administration with an accounting focus. The supervisor has more than ten years of scientific experience in financial accounting and reporting. In addition, they have both demonstrated their capabilities in prior research (Ruhwedel et al. 2009). Thus, with their qualifications, and after passing through all the control levels, I was able to ensure a high level of reproducibility for my study.

Obtaining *accuracy*, however, can be somewhat more difficult, because there are no established standards for forward-looking reporting quality that address the question in this study. As mentioned in section 2.2.2, for Germany the *Best Annual Report* index can be used, so I take that as the best proxy. I obtained the results for 2005-2009, and conducted a correlation analysis to compare the scope index (see section 2.3.3.1.2) with the forward-looking report index from the *Best Annual Report*. I use the scope index because it is more comparable than the quality index because the concept of the scope index is more similar to the index of the *Best Annual Report*. The Pearson correlation is 0.58 (p-value: 0.01) the Spearman correlation is 0.57 (p-value 0.01), which is quite high. This result indicates a good level of accuracy, because my index is highly³¹ correlated with the *Best Annual Report* index.

2.3.4.2 Validity

Face validity is achieved by using, as discussed earlier, the human-coded approach (the computer-based method has too many shortcomings in this situation). For my purposes, it is important to understand the total context of the forward-looking report, with the precision, the forecast horizon, and the economic direction of the forecasted information. Relying on the manual method produces a higher degree of face validity for my study.

³¹ Correlations above 0.5 are considered high (Cohen and Manion 1980).

Empirical validity is obtained by conducting empirical analyses, including the constructed disclosure index. The results in sections 3.5 and 4.6.2 are in accordance with prior research and existing theories, and imply empirical validity.

To achieve *content validity*, I consider earlier research, and I rely on existing principles and theoretical frameworks such as GCC and GAS 15. I also consulted audit company checklists, in order to include their viewpoints. To address any content validity problems, I find that the coding and recoding of the categories, as well as refining the item lists, are sufficient.

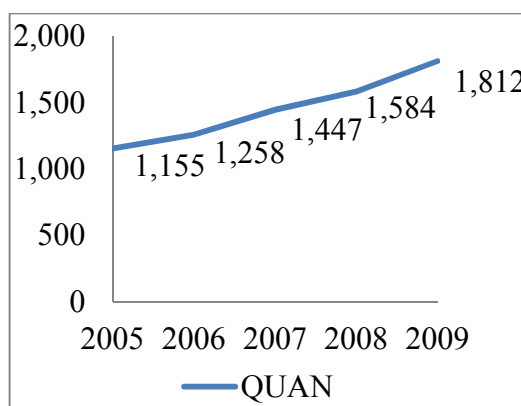
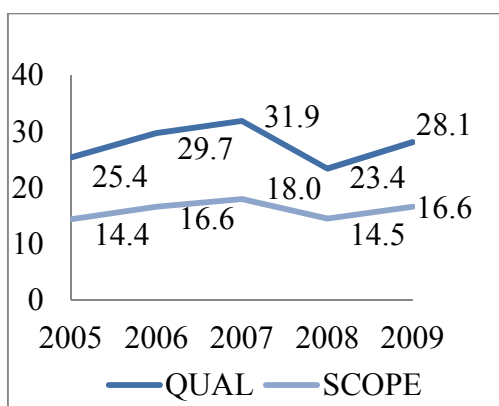
Construct validity, as discussed in section 2.2.1.4.2 is difficult to obtain. My results cannot be compared to those of research on the same question that uses a different method. However, my empirical results from sections 3.5 and 4.6.2 can be compared to prior research that uses the same method in a similar context.

2.3.5 Index Construction Results

2.3.5.1 Disclosure Indices Over Time

Comparing the disclosure quality, scope, and quantity indices, I observe various patterns over time. For example, Figure 6 illustrates that the development of the quality and scope indices exhibit similar patterns. The scope index has a lower overall score than the quality score. This is not surprising, because both indices use the same items and differ only in the weighting of quantitative information. The results show that the different weightings do not influence the development over time, a finding that is in line with prior research using weighted and unweighted indices (Chow and Wong-Boren 1987; Prencipe 2004; Robbins and Austin 1986).

In contrast, the quantity measure, which is based on the number of words of the forward-looking report, exhibits a different development pattern. As illustrated in Figure 7, it increases continuously from 2005 through 2009, and it does not decrease in 2008, as the other two indices do.



Notes. These figures illustrate the development of the mean of the different disclosure indices quality, scope and quantity over time.

Figure 6: Quality and Scope Over Time

Figure 7: Quantity Over Time

2.3.5.2 Descriptive Statistics

Table 3 shows the mean, standard deviation, median, minimum and maximum of the total and yearly disclosure quality, scope index and the quantity measure. The mean (median) quality and scope disclosure index was 25.45 (23.0) and 14.40 (13.0) in 2005, increased to 31.89 (28.0) and 18.04 (17.0) in 2007 respectively and decreased to 23.39 (21.0) and 14.54 (13.0) in 2008 respectively, whereby in 2009 both indices increased to 28.12 (26.8) and 16.63 (15.5). For the quality index, the score in 2008 was lower than in 2005, for the scope index, the reporting level remained almost the same. The mean quantity measure shows an increase of volume in all years from 1,155 (925) words in 2005 to 1,812 (1,533) words in 2009, implying that companies still report in terms of quantity during crisis times. However, the increase is a little lower than in the year before and the year after crisis. The different developments of the three disclosure measure are not surprising, because the quantity measure is based on a different principle than the other two indices. From the descriptive analysis, I would expect to find empirical analysis differences as well. In section 3.5, I conduct empirical tests to determine whether the descriptive results can be confirmed by the empirical analysis.

The differences of minimum and maximum disclosure quality, scope and quantity score show that there is a great variation in the firms' reporting behavior. In sum, the range for the quality index is between 0 and 137, between 0 and 52 points for the scope index, and between 59 and 5,166 words for the measure of quantity.

Year	N	Mean	Std. Dev.	Median	Minimum	Maximum
QUAL_{jt}						
2005	96	25.45	16.16	23.0	3	79
2006	116	29.69	21.15	27.5	1	137
2007	122	31.89	20.56	28.0	1	135
2008	123	23.39	17.90	21.0	0	129
2009	122	28.12	16.76	26.8	5	95
Total	579	27.78	18.87	25.0	0	137
SCOPE_{jt}						
2005	96	14.40	8.18	13.0	1	38
2006	116	16.60	10.01	16.0	1	48
2007	122	18.04	9.77	17.0	1	50
2008	123	14.54	9.25	13.0	0	51
2009	122	16.63	8.60	15.5	1	52
Total	579	16.11	9.30	15.0	0	52
QUAN_{jt}						
2005	96	1,155.39	847.33	924.5	203	3,673
2006	116	1,257.96	901.49	994.0	171	4,690
2007	122	1,447.36	980.47	1,241.5	138	4,976
2008	123	1,584.36	1,040.55	1,467.0	59	5,166
2009	122	1,812.49	1,112.03	1,532.5	138	5,010
Total	579	1,467.04	1,010.67	1,214.0	59	5,166

Notes. This table shows the distribution of the different forward-looking disclosure indices: quality, scope and quantity per year. I define the variables as follows: $QUAL_{jt}$ = firm j 's year t absolute forward-looking disclosure quality index; $SCOPE_{jt}$ = firm j 's year t absolute forward-looking disclosure scope index; and $QUAN_{jt}$ = firm j 's year t absolute forward-looking disclosure quantity measure.

Table 3: Descriptive Statistics

Table 4 shows the Pearson and Spearman coefficients of correlations between the disclosure quality and scope index and the measure of disclosure quantity. The correlation among $QUAL$ and $SCOPE$ shows significantly high Pearson (Spearman) correlations 0.918 (0.916). This is not surprising as both indices are based on the same items differing only in the weighting. However, the relationship between $QUAN$ and $QUAL$ and $SCOPE$ is lower at $p=0.561$ (0.546)

and $p=0.631$ (0.623), respectively. The correlation between *QUAN* and the disclosure indices shows that there is a relationship between disclosure level and volume implying that a certain volume is required to obtain a higher quality/scope level.

Pearson correlation	QUAL _{jt}	SCOPE _{jt}	Spearman correlation	QUAL _{jt}	SCOPE _{jt}
SCOPE _{jt}	0.918***		SCOPE _{jt}	0.916***	
QUAN _{jt}	0.561***	0.631***	QUAN _{jt}	0.546***	0.623***

Notes. This table shows the Pearson and Spearman correlations among QUAL_{jt}, SCOPE_{jt} and QUAN_{jt}.

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: QUAL_{jt} = firm j's year t absolute forward-looking disclosure quality index; SCOPE_{jt} = firm j's year t absolute forward-looking disclosure scope index; and QUAN_{jt} = firm j's year t absolute forward-looking disclosure quantity measure.

Table 4: Correlation Matrix

2.3.5.3 Alternative Weighting of the Quality Score

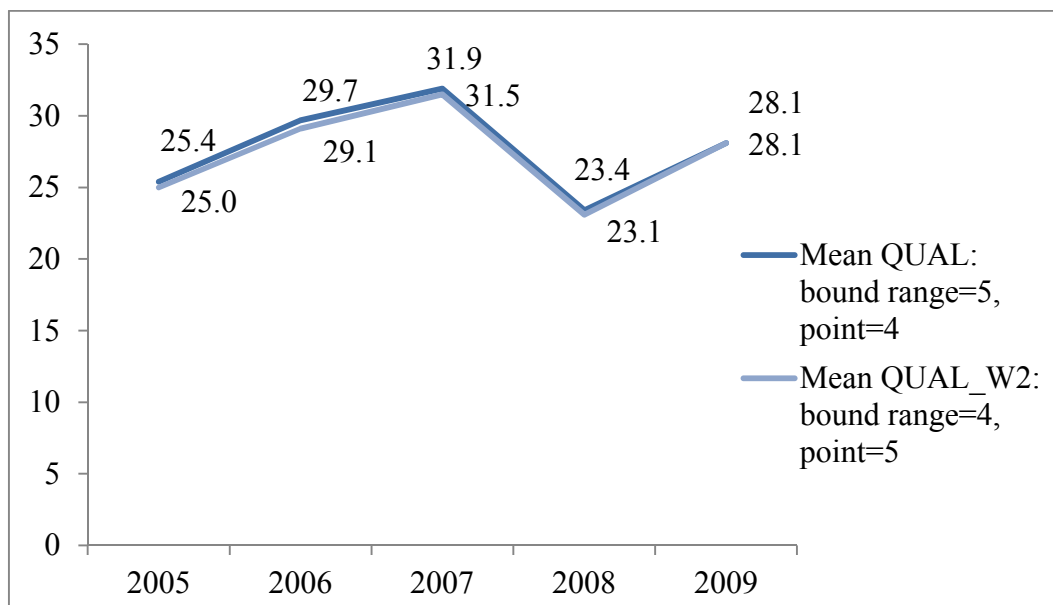
As shown in section 2.3.3.1.1, the ideal weighting for the different levels of ex ante precision is not apparent. In order to show that variations in weighting do not affect the results to any significant extent, I calculate an additional quality score. Point forecasts are scored with 5 points, and bound range forecasts with 4 points. In the original quality index, I used the opposite scoring (e.g., 5 for bound range forecasts, and 4 for point forecasts).

Figure 8 shows the development of the mean quality index over time for both types of weighting. For 2005-2008, the mean quality index of *QUAL*³² is slightly higher than the quality index *QUAL_W2*.³³ For 2009, the mean quality index for both options is exactly the same. These results indicate that modifying the weighting of the point and bound range forecasts has only a marginal effect on the results. In section 3.5.3.3, I use an empirical setting to analyze the effects of the

³² *QUAL* scores bound range forecasts with 5 points and point forecasts with 4 points.

³³ *QUAL_W2* scores bound range forecasts with 4 points and point forecasts with 5 points.

different *QUAL* and *QUAL_W2* indices on the determinants of forward-looking reporting.



Notes. This figure illustrates the development of the mean of the different disclosure quality indices *QUAL* and *QUAL_W2* over time.

Figure 8: Different Quality Indices Over Time

2.3.5.4 Ranking of Quality, Scope, and Quantity Indices

To compare the positioning of companies across the three different scores, I rank companies within each index according to their total index score. Table 5 gives the different rankings for the indices for the top 10 companies in each index. It also shows a second quality score (*QUAL_W2*), which was discussed in section 2.3.5.3. Note that, compared to the quality score in column 1, the quality score in column 4 scores point forecasts (= 5 points) higher than bound range forecasts (= 4 points).

Company	Rank QUAL	Company	Rank SCOPE	Company	Rank QUAN	Company	Rank QUAL_ W2
Vossloh	1	K + S	1	K + S	1	Vossloh	1
FMC	2	Vossloh	2	Jenoptik	2	FMC	2
Adidas	3	FMC	3	Fresenius	3	Adidas	3
Duerr	4	Duerr	4	Adidas	4	K + S	4
K + S	5	Adidas	5	FMC	5	RWE	5
RWE	6	Thyssen Krupp	6	Solar- world	6	Gilde- meister	6
Jenoptik	7	Gilde- meister	7	RWE	7	Jenoptik	6
Gilde- meister	8	Jenoptik	8	Vossloh	8	Thyssen Krupp	8
Thyssen Krupp	9	RWE	9	Gilde- meister	9	Dycker- hoff	9
Dycker- hoff	10	Dycker- hoff	10	Salzgitter	10	Wincor Nixdorf	10

Notes. This table shows the rankings of the different disclosure measures QUAL, SCOPE, QUAN and QUAL_W2.

Table 5: Ranking of Disclosure Indices

The quality and scope indices have the same top 10 companies, but their order differs somewhat. This result is expected, because the two indices are based on the same items and differ only in terms of weighting. By comparing the two quality scores in columns 2 and 8, I obtain an intersection of nine companies. The top three are the same for both indices, and the result is similar for the quantity score. Seven of the ten companies of the quality and scope ranking are among the ten longest reports. This implies that a certain level for quality and scope is tied to the length of the report.

Comparing the different indices and weightings shows some differences in the rankings. The different order of the firms according to usage of the index might influence the results of empirical analyses. As mentioned before, I test the implications of those variations empirically in sections 3.5.2 and 3.5.3.3.

To compare the top 10 companies for the subindices of the quality index, I use the ranking of the original quality index, and compare it to the ranking of three subindices (see Table 6). First, I use an index for earnings and revenue forecasts

(*QUAL_ER*). Only six companies overlap in the top 10. The same is true for the second index, which contains earnings, revenue, and profitability forecasts (*QUAL_ERP*). This result shows that the ranking looks quite different when focusing on only specific aspects of the index. The third index, *QUAL_CS*, consists of quantifiable company-specific information of category II (see section 2.3.3.1.1). The ranking for the first four companies is identical to that for the original quality index. The other companies in the top 10 are also the same, but again differ slightly in ranking. For the index *QUAL_CS* I also analyze the effect of variation on the determinants of forward-looking reporting in section 3.5.3.3.

Company	Rank QUAL	Company	Rank QUAL_ ER	Company	Rank QUAL_ ERP	Company	Rank QUAL_ CS
Vossloh	1	Vossloh	1	Vossloh	1	Vossloh	1
FMC	2	CEWE Color	2	Adidas	2	FMC	2
Adidas	3	FMC	3	Gerry Weber	3	Adidas	3
Duerr	4	Centrotec	4	FMC	4	Duerr	4
K + S	5	Duerr	5	Duerr	5	RWE	5
RWE	6	RWE	6	RWE	6	Jenoptik	6
Jenoptik	7	Dyckerhoff	7	CEWE Color	7	K + S	7
Gilde- meister	8	Curanum	8	Centrotec	8	Dyckerhoff	8
Thyssen Krupp	9	Thyssen Krupp	9	Jenoptik	9	Gilde- meister	9
Dyckerhoff	10	Elring Klinger	10	Curanum	10	Thyssen Krupp	10

Notes. This table shows the rankings of the different disclosure quality indices *QUAL*, *Q_ER*, *Q_ERP* and *Q_CS*.

Table 6: Different Quality Subindices

These results show again that using different index definitions leads to different company rankings, which could affect the results of the analysis. The closer the variation is to the original index, the lower the discrepancies.

Note that the differences in the descriptive analysis across indices are in line with prior research. Bravo et al. (2009) compare four different disclosure scores

on an annual basis. They find stronger differences among the index rankings than I do. These differences, however, are justified because of the different construction method of their indices.

The results in the empirical analysis, which are provided in sections 3.5 and 4.6, are even more interesting than the results in the descriptive analysis.

2.4 Summary

The aim of this chapter was twofold: 1) to provide some theoretical background knowledge on disclosure indices, and 2) to illustrate the process of self-constructing different indices and testing their sensitivities.

Finding a disclosure index for the purpose of the research question is challenging, as there are numerous options available. I reviewed the various characteristics of disclosure indices, and provided a theoretical description of what possibilities exist for their use. I also addressed the importance of validity and reliability in disclosure index research, and explain these ideas in great detail.

This chapter contributes to the discussion of using several different indices. Prior research has not tended to use more than one index. However, as Bravo et al. (2009) show, the variations of a disclosure index might affect the results. To address this issue, I construct three disclosure indices, and compare them in a descriptive analysis. Prior research has also lacked reliability and validity tests for their indices. I also consider these measures in detail, and explain their use for the constructed indices.

I use quality, scope, and quantity indices. Disclosure quality and scope show a similar pattern over time. This result is not surprising, because both are based on the same disclosure items, and only vary according to the weighting of quantitative information. Comparing the quality and scope indices in a ranking of firms, I find only slight differences for the top 10 companies. They vary only in their positioning. Thus, these indices seem to measure similar degrees of disclosure, and only slight differences would be expected for empirical analyses.

However, I do find differences when using the quantity measure. It not only develops differently over time than the other indices, but it also ranks firms differently. Although most of the top 10 firms in the quality and scope rankings are also in the top 10 for quantity, the differences are stronger. And these differences are likely to be more obvious in an empirical analysis.

My study faces certain limitations. Because I chose to use a manual approach, I am only able to analyze a limited number of forward-looking reports. It would be interesting to extend my sample to obtain a fuller picture of the German market. But compared to, e.g., Grüning's (2011) study, the sample size is satisfactory. Additionally, my focus is only on forward-looking reports. Considering information not captured by the forward-looking report, such as press releases or analyst reports, could also enrich the results as a complement to the forward-looking report.

Another way to advance disclosure index research would be to make the construction more transparent and reproducible, thus reducing subjectivity. Most prior research has lacked these traits either partly or completely. Reliability and validity measures should also be considered in order to justify the index construction. Future research may also want to concentrate on the statistical method within the computer-based approaches. It would be helpful to develop and test software that would be usable for a large number of different research purposes, as well as individual software for specific problems. This standardization of software could advance content analysis and enhance the comparability of different studies. Ideally, as computer-based approaches improve, higher success rates will be obtained for both types of approaches.

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3 The Quality and Quantity of Forward-Looking Disclosures: The Effect of Extreme Uncertainty in Times of Crisis³⁴

3.1 Introduction

In this chapter I examine the development of forward-looking reporting quality, scope and quantity of German firms during the global financial crisis and non-crisis periods. Additionally I analyze factors that influence the dissemination of forward-looking information.

Corporate managers employ forecasts to communicate expectations about their firms' future and assist investors with firm valuation (Beretta and Bozzolan 2008). My study concentrates on management forecasts that are published in a specific section of German annual reports: the forward-looking reports which are mandated by the German Commercial Code (GCC).

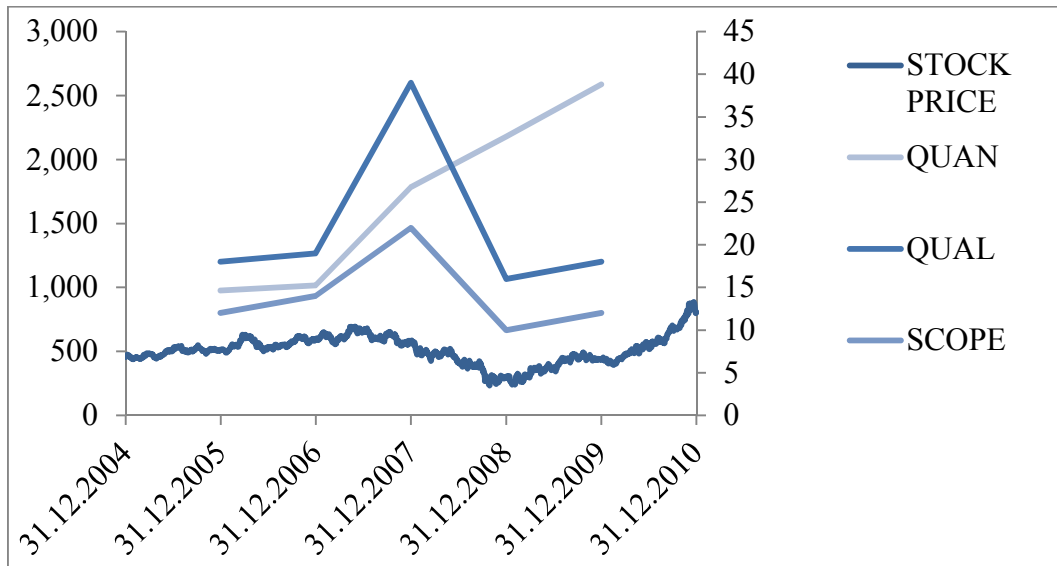
The German setting is especially interesting because although the disclosure of an annual forward-looking report is mandated by law and audited, no specific rules exist in the GCC regarding the scope, structure, items to be reported, time horizon of forecasts, assumptions and other relevant parameters. Consequently, the forward-looking report can, to some extent, be viewed as a form of voluntary disclosure subject to management's decisions. This raises the question if companies are willing and able to provide useful and precise forecasts, especially in times of economic uncertainty. Further, the litigation risk is low in Germany compared with other developed countries such as the U.S. for provision of erroneous forecasts unless it can be proved that such forecasts have been deliberately made which is very difficult to establish due to lack of specific regulation (Fleischer 2006).

During the recent global financial crisis (GFC), Germany endured one of its most severe recessions as its GDP declined by 4.7% in 2009. During that period,

³⁴ This chapter is based on the working paper of Lerchenmüller et al. (2012).

the Financial Reporting Enforcement Panel (FREP) reported a number of deliberate instances of omission of future orientated information within management reports (FREP 2009). For instance, Merck AG provided a forward-looking report but without any forecasts or qualitative statements concerning its future in their 2008 annual report. Statements like “in the financial year 2009, we will be confronted with unprecedented imponderables” (Salzgitter 2008, 158) or “towards the end of 2008 the situation on international financial markets climaxed in an unprecedented fashion [...] the rapid pace of the economic downturn and uncertainty [...] make reliable forecasts extremely difficult, even for the near future” (BMW 2008, 69) show the obscure situation companies were in the end of 2008. To illustrate, Figure 9 depicts BMW’s reporting behavior, measured in terms of the quality, scope and quantity of the forward-looking report³⁵, against the development of the stock price over time. Quality and scope decrease dramatically in 2008, underlining BMW’s uncertain situation reflected in the stock price decline towards the end of 2008. In contrast, quantity rises steeply from 2006 through 2009. In 2009, forward-looking disclosure quality and scope appear to be catching up with the economic recovery reflected in BMW’s stock price. The example of BMW shows that crisis situations potentially affect different dimensions of forward-looking disclosure behavior differently.

³⁵ Quality, scope and quantity refer to forecasts for subsequent years.



Notes. This figure illustrates the development of the different disclosure indices quality, scope and quantity over time as well as the development of the stock price for BMW. The primary axis reflects the values for the stock price and for the quantity (illustrated as number of words). The secondary axis reflects the values for quality and scope.

Figure 9: Stock Price, Quality, Quantity and Scope Over Time of BMW

Although forward-looking disclosure has been studied in Germany, most of these studies are of descriptive nature (Ruhwedel et al. 2009; Barth 2009; Knauer and Wömpener 2010; Barth and Beyhs 2010). For example, Barth (2009) examines forward-looking reporting before and after the adoption of the new regulations in Germany over the period 2004 to 2006. She finds that disclosure quantity has increased over time and only firm size is associated with forward-looking information. Later, using the same index Barth and Beyhs (2010) analyze the forward-looking reporting quality of 113 German companies between 2004 and 2009 and find that the disclosure quality had decreased in 2008. However, up till now limited empirical evidence has emerged on forward-looking reporting measurement and determinants encompassing all types of forecasts. I contribute to the managerial forecast literature in different ways. First, I rigorously analyze a large number of listed companies covering a period of 5 years subsequent to the implementation of ‘Bilanzrechtsreformgesetz’ (BilReG) in 2004, designed to improve the quality of management report (Fink and Keck 2005), up to 2009.

Second, I go beyond specific forecast types (e.g. earnings forecasts) to consider a broad array of forward-looking information provided in German forward-looking reports. For example, where most prior studies focus on a notion of quality, I analyze three distinct dimensions of forward-looking disclosure behavior - quality, scope and quantity – in terms of their determinants incorporating several firm-specific attributes and market factors. Third, this study is among the first to consider the effects of extreme uncertainty – as observed during the recent global economic and financial crisis – on these dimensions of forward-looking disclosure behavior in Germany.

Using data from 2005 to 2009 listed on the German HDAX and SDAX I measure the level of forward-looking disclosure by applying a self-constructed quality and scope index based on a predefined list of items derived from literature, auditing check lists and German Accounting Standard (GAS) 15. In addition, I use a third measure, quantity which counts the number of words of the forward-looking report. Quality, scope and quantity are regressed on crisis and different other company specific variables. I find that the quality and scope of forward-looking disclosure are negatively related with crisis but the quantity of disclosure did not decline during the crisis. These results suggest that extreme uncertainty negatively affects the quality and scope of firms' voluntary disclosure behavior. Furthermore, firms might attempt to obfuscate this decrease in quality by maintaining a constant level of disclosure quantity. The results are stable to variations of the index definition, as well as for different other modifications.

In view of the current revision of the German Accounting Standard 'Management Report' that includes the regulations on forward-looking reporting, my results will have policy implications for the German standard setting body by providing timely and rigorous analysis of forward-looking information as well as will serve as a starting point for companies to rethink and restructure their reporting behavior in order to fulfill the demands of different user groups.

The remainder of this chapter is organized as follows. In section 3.2, I describe the institutional setting in Germany. Section 3.3 reviews prior literature and summarizes the hypotheses. Subsequent to a description and presentation of the research design and the sample in section 3.4, the empirical results are presented in section 3.5. In the final section 3.6 I provide a summary of the study and draw conclusions about my major findings.

3.2 Institutional Background

As illustrated, in section 2.3.1 the German forward-looking reporting is a mixture between mandatory and voluntary reporting. Forward-looking information has been a mandatory component of the management report since 2005 (Krawitz and Hartmann 2006). The precise contents of management reporting are regulated by the GCC's sections 289 and section 315 for groups of companies. For future-oriented information, the GCC s. 315 [1] states that a company must assess and discuss the expected development of the group, as well as the underlying assumptions about its significant risks and opportunities. Companies reporting under IFRS are also required to prepare management reports in accordance with the GCC.

Forward-looking reports provide information about all kinds of forecasts and company prospects. Compared to management forecasts, however, the focus is not only on earnings, such as those issued in press releases. The richness and scope go far beyond that, as the information is much more holistic, and thus concentrates on many different facets of the firm's possible future.

In addition to the minimum disclosure requirements mentioned in the GCC, further information about forward-looking reports was not required by law. However, the German Accounting Standards Board (GASB) amended this regulation and issued recommendations and a framework for presenting management and forward-looking reports in German Accounting Standard (GAS) No. 15, "Management Reporting". However, GAS 15, as with all GAS, is only a

recommendation, and is not legally binding. For a detailed overview of the institutional background, see section 2.3.1

3.3 Related Literature and Hypotheses

3.3.1 Related Literature

Voluntary disclosure, or discretionary-based disclosure (e.g. Verrecchia 2001), is the provision of information in excess of mandatory requirements. Voluntary disclosure behavior can be modeled using game theory. The central premise is that an entity discloses favorable information and holds back unfavorable information (Dye 2001). Companies are expected to engage in voluntary disclosure when the benefits of additional disclosure outweighs the costs (Verrecchia 1983, 2001). Disclosure is associated with various costs such as for the information collection and processing (Foster 1986). Further, competitive disadvantage costs arise due to the fact of releasing information voluntarily and thus also informing competitors (Verrecchia 2001). Providing additional prospective information might be advantageous in order to reduce the conflicts between company insiders and other interest groups that arise due to information asymmetry (Healy and Palepu 2001; Hossain et al. 1995), leading to reduction of agency as well as political costs (Chavent et al. 2006). In addition, the increase of forward-looking information disclosure might result in a lower cost of equity capital, as suggested by Kristandl and Bontis (2007). Company specific forward-looking information is important to investors and analysts and helpful in the decision-making process of forecasting prospect numbers (Kieso and Weygandt 1995). For the German setting, surveys show that the forward-looking report is considered among the most important parts of the management report (Kajüter et al. 2010; Prigge 2006). Especially during unstable economic conditions, investors need relevant and reliable information for their decision-making processes as imprecise or no disclosures cause for distrust and also attract the attention of regulation (Ruhwedel et al. 2009). The absence of reliable forecasts might force investors and analysts to rely on other sources that might not be as accurate as the companies' own forecasts (Kieso and Weygandt 1995).

I contribute to two research areas. On the one hand I contribute to international forward-looking disclosure determinant studies, on the other hand to recent German related forward-looking literature which is up to now rather anecdotal.³⁶

Prior forward-looking disclosure research mainly focuses on earnings forecasts. Few studies have examined the determinants of a broader type of forward-looking disclosure behavior. Li (2010) examines the tone and content of forward-looking information in 10-K and 10-Q filings and its determinants. By employing a computer-based approach to examine the forward-looking information he analyzes 140,000 filings and finds that firms with a better current performance, lower accrual, smaller firm size, lower market-to-book ratio, less return volatility, lower MD&A Fog index and longer history are more likely to have more positive forward-looking reports. Aljifri and Hossainey (2007) find forward-looking information is significantly associated with debt ratio and profitability of UAE listed companies. Celik et al. (2006) find firm structure, profitability, the level of foreign investment and the proportion of institutional investors are significantly associated with forward-looking information disclosed by Turkish companies. Hossain et al. (2005) find disclosure of prospective information is associated with investment opportunity for listed companies in New Zealand.

For German firms, Barth (2009) examines forward-looking reporting before and after the adoption of the new regulations in Germany, over the period 2004 to 2006. Using a self-constructed index, which serves as a proxy for the scope of all the reported items, she finds that the index has increased over time and only firm size is associated with forward-looking information (Barth 2009). Using the same index, Barth and Beyhs (2010) analyze the forward-looking reporting quality of 113 German companies between 2004 and 2009. The index is weighted according to the results of a survey among auditors and financial analysts. They observe increasing disclosure quality until 2007, a decrease in 2008, and again an increase

³⁶ Appendix 1f gives an overview on prior research on the aforementioned studies.

in 2009. Moreover, in 2008 an increase of qualitative and comparative information is observed, whereas in 2009 point and range forecasts increased. The same results are obtained by the study of Ruhwedel et al. (2008). Knauer and Wömpener (2011) interview nine firms and six audit firms to identify companies' forecasting behavior. They provide evidence that the reporting behavior changed due to the global financial crisis. The firms provide less precise forecasts and rather use qualitative statements in times of uncertainty. They also observe that firms as well as audit firms find forecasts most useful during unstable economics circumstances.

With respect to focusing on earnings and revenue forecasts, Knauer and Wömpener (2010) have examined if the ex ante reported earnings and revenues numbers in the forward-looking reports for German firms have been achieved subsequently. The ex post accuracy of revenue and earnings forecast for 2005-2007 is 38.8% for earnings and 41.0% revenue forecasts. Choi et al. (2010) examine earnings forecasts and their relation with forecast surprise and uncertainty. They provide evidence that the ex ante forecast precision is higher with lower earnings volatility, a measure for uncertainty, and a lower forecast surprise. Additionally they find that forecasts for bad news are less precise than those for good news. Ajinkya et al. (2005) could find a higher ex ante forecast precision of earnings forecasts for firms with a higher number of institutional owners. Nölte (2009) investigates the determinants of management forecasts for German DAX and MDAX companies. He provides evidence that companies with a low percentage of intangible assets, a low EPS-volatility, a low volatility of the prior year earnings, a higher market to book value, and that a higher need for external financing provide more precise forecasts. Baginski et al. (2004) examine the determinants of why some companies explain their earnings forecasts. They provide evidence that larger firms in a less regulated environment provide additional explanations accompanying earnings forecasts than smaller companies. They also find that explanations are more likely for bad news earnings forecasts than for good news. Kent and Ung (2003) evaluate why Australian companies

voluntarily disclose forward-looking earnings information. Using a self-constructed index based on the presence or absence of earnings forward-looking information they find that firms with less volatile earnings and larger firms are more likely to provide earnings forecasts. Clarkson et al. (1999) divide their sample in good news and bad news forecasts. They observe good news firms increase disclosure, when they need external financing and decrease disclosure when they face competitors entering the market. For bad news firms the disclosure extent is the opposite.

3.3.2 Hypothesis Development

The global financial crisis affected the world economy and the companies. Extreme uncertainty, reflected in economic downturns and volatility, makes forecasting difficult (Choi et al. 2010; Lahiri and Sheng 2010).

Germany endured one of its most severe recessions during the global financial crisis. Compared to other European countries, only Hungary was hit more severe. The GDP for 2009 decreased by 4.7%, leading to the most severe recession since World War II. In 2010 the German economy recovered rapidly and its GDP increased by 3.6%, which is the largest increase since the reunification in 1990 (Federal Statistical Office 2011). Especially in times of financial crisis the firms' communication is more important than under favorable economic circumstances. Users of annual reports need facts and figures, enriched with a sound argumentation. For the case of forward-looking reports it means, that the reported prospective information could be enhanced by reporting different scenarios of pessimistic, realistic and optimistic estimations of the company. The reporting during crisis needs to create trustfulness and the user still has to be provided with information (Höbel and Hofmann 2009). The unclear and unsecure perspectives in the end of 2008 led to an enormous uncertainty for the companies. The uncertainty is reflected in the companies' forecasts as well as in the forward-looking reports.

As Germany experienced extreme uncertainty during the global financial crisis there was a call for temporary waiving forward-looking disclosure. However, the German financial accounting standard-setter GASB gave the recommendation not to waive forecast disclosure because lack of forecasts would unsettle the markets and investors. This created an interesting problem for firms: How to comply with disclosure recommendations in a situation where forecasts were virtually impossible? I predict that the uncertainty in the crisis situation affected the quality, scope and quantity of forward-looking disclosures differently, as explained in more detail below.

In line with prior literature (Barth 2009; Barth and Beyhs 2010; Knauer and Wömpener 2010, 2011; Ruhwedel et al. 2009), I expect that firms reduce the ex ante precision of their forecasts, with or without a reduction in the range of information items given, in times of crisis, decreasing forward-looking disclosure quality, *ceteris paribus*. This leads to my first hypothesis, stated in alternative form:

H1: The disclosure quality in forecast reports is lower in crisis periods than in non-crisis periods, *ceteris paribus*.

The degree to which this reduction in disclosure quality affects disclosure scope depends on the degree to which firms reduce the number of items on which forecasts are being disclosed. In the extreme, firms reduce only the ex ante precision of forecasts, leaving the range of forecast items constant. For example, a firm could continue providing earnings, sales and R&D budget forecasts, but substitute vague qualitative statements for the previous point forecasts. This type of behavior would reduce my quality measure (H1) whereas it would leave my scope measure unaffected. I, therefore, predict that disclosure scope goes down in crisis times, but to a lesser degree than does disclosure quality. This expectation leads to my second set of hypotheses, also stated in alternative form:

H2a: The disclosure scope in forecast reports is lower in crisis periods than in non-crisis periods, *ceteris paribus*.

H2b: The decrease in disclosure scope in crisis periods is less than the decrease in disclosure quality, *ceteris paribus*.

The effect of a crisis situation on forecast disclosure quantity is not exactly clear *ex ante*. On the one hand, a reduction in scope could lead to an equivalent reduction in volume narrated, my measure of disclosure quantity. On the other hand, if firms expect a reduction in forward-looking reporting volume to signal to the market that management is ‘flying blind’, it may hold constant or even increase disclosure quantity to compensate for the lower degree of substance. Anecdotal evidence given in Figure 9 as well as prior studies (Knauer and Wömpener 2010; Ruhwedel et al. 2009) show that this may be the case. Due to these conflicting predictions, I hypothesize:

H3: The disclosure quantity in forecast reports differs between crisis and non-crisis periods, *ceteris paribus*.

3.4 Research Design and Sample

3.4.1 Model Specification

Prior research uses a number of different determinants for (voluntary) disclosure. I test my predictions using pooled regression based on the following model:

$$DISC_{jt} = \beta_0 + \beta_1 SIZE_{jt} + \beta_2 CHS_{jt} + \beta_3 LEV_{jt} + \beta_4 ROE_{jt} + \beta_5 VOLA_{jt} + \beta_6 AUD_{jt} + \sum_{k=1}^8 \alpha_k \beta_7 IND_j + \beta_8 CRISIS_t + \varepsilon_{jt} \quad (1)$$

where:

$DISC_{jt}$ captures three dimensions of disclosure behavior of firm j for fiscal year t : Forward-looking disclosure quality ($QUAL$)³⁷, scope ($SCOPE$), and quantity ($QUAN$). $QUAL$ is the absolute forward-looking disclosure quality index, $SCOPE$ is the absolute forward-looking disclosure scope index, and $QUAN$ is the absolute forward-looking disclosure quantity;

³⁷ For different specifications of $QUAL$, see 3.5.3.3.

$SIZE_{jt}$	is the log of firm j 's total assets at the end of fiscal year t ;
CHS_{jt}	is firm j 's percentage of equity owned by the insiders ³⁸ to all equity of the firm at the end of fiscal year t ;
LEV_{jt}	is firm j 's total debt divided by the total assets at the end of fiscal year t ;
ROE_{jt}	is firm j 's return on equity (net income before preferred dividends - preferred dividend requirement) / average of last year's and current year's common equity * 100) at the end of fiscal year t ;
$VOLA_{jt}$	is firm j 's variance of total shareholder return over the last five years at the end of fiscal year t ;
AUD_{jt}	is an indicator variable equal to 1 if firm j is audited by a Big4 company for fiscal year t , and 0 otherwise;
IND_j	is a vector of industry dummy variables equal to 1 if firm j is operating in one of the following industries: utilities, telecommunications, industrials, information technology, pharma & healthcare, basic materials, consumer goods and consumer services, and 0 otherwise;
$CRISIS_t$	is an indicator variable, equal to 1 if the fiscal year t is considered to be crisis year (2008), 0 otherwise (2005-2007 and 2009) ³⁹ .

Datastream from Thompson Reuters serves as a data source for the control variables $SIZE$, CHS , LEV , ROE and $VOLA$. The dependent variables $QUAL$, $SCOPE$ and $QUAN$ as well as the control variable AUD and independent variable

³⁸ Company insiders are among others e.g. offices, directors and their immediate family, shares held in trust or pension benefit plan.

³⁹ For different specifications of $CRISIS$, see 3.5.3.4.

CRISIS are hand-collected. The control variable *IND* is categorized according to the classification scheme of Deutsche Börse.

As I predict different determinants for the quality, scope and quantity dimensions of forward-looking disclosure, I use three different dependent variables: quality (*QUAL*), scope (*SCOPE*), and quantity (*QUAN*). In section 3.4.2, I provide detailed information on the measurement of my dependent variables.

I then include variables assessed in prior research to explain disclosure behavior (see for a review of disclosure studies Ahmed and Courtis 1999). I include *SIZE*, as disclosure quality, scope and quantity are expected to increase in firm size. Agency theory predicts higher agency cost and information asymmetries for larger firms due to more complexity in operations (Cooke 1989). Additionally, large firms often have a better internal planning and control system; consequently, the internally generated information can also be used for external reporting purposes and hence the information collection is less costly for larger firms (Clarkson et al. 1994; Ahmed and Nicholls 1994). According to the political cost theory large firms are rather in the focus and visible for regulators, public interest and other stakeholders. Their activities and in particular reporting are more closely watched as their attention is higher than for small firms (Buzby 1975; Wallace and Naser 1995), hence the predicted sign for firm size is positive. *CHS* is included, as differences in the information levels between insiders and other shareholders lead to conflicts and information asymmetries due to unequal dispersion of information (Fama and Jensen 1983). Company insiders are more likely to be better informed due to their inside position and have access to superior information than company outsiders. Thus, they are not dependent on external information (Jensen and Meckling 1976). Consequently, companies having more managerial shareholders do not have incentives to disclose more information than necessary; therefore the expected sign is negative. In addition, I incorporate the variable *LEV* in the model. Companies with a higher leverage face higher agency cost (Jensen and Meckling 1976). Management can reduce information

asymmetries and thus also agency costs by providing adequate disclosure. Thus, firms with a high level of leverage are expected to voluntarily disclose more to mitigate creditors' concerns about the solvency of their firm and to minimise agency costs between creditors and management (Hossain and Hammami 2009), the predicted sign is positive. *ROE* is included as it is expected that highly profitable firms are more likely to disclose information as they want to differentiate themselves from low profitable firms (Meek et al. 1995). In addition, management has incentives to disclose profitable numbers to strengthen their own position as well as to support the continuance of their compensation (Malone et al. 1993). Further, highly profitable firms are more likely to face negative public perception and regulatory intervention. Thus, they might (voluntarily) provide more disclosure in order to justify their numbers, avoid external regulation and to reduce political costs (Ng and Koh 1994), the expected sign is also positive. I include *VOLA* to capture the variability of firm performance. A firm in a less volatile environment is more likely to have better forward-looking disclosure because there is more certainty about its future (Li 2010). Thus, low performance volatility increases the ability to forecast. Especially in times of crisis this factor is expected to play an important role, the predicted sign is negative. Next, I include *AUD* as large, skilled, and well-known auditing firms may push companies to disclose more information and may lead to an increase of the precision of the financial information (Firth 1979; Singhvi and Desai 1971). Consequently, the choice of the auditing company is likely to be linked to the disclosure policy of the firm (Craswell and Taylor 1992), the expected sign is positive. Although "there is no definite theory to expect one industry to outperform any other in disclosure" (Wallace and Naser 1995, 325) differences might be expected, supposing that different industries might have different disclosure behaviors and patterns due to their industry specific conditions. The reporting can be considered as signal to the market to show compliance with industry best practice. The differentiation from the industry standard can be considered as a bad signal to the

market (Watson et al. 2002). As there might be differences in a firm's disclosure behavior according to industry affiliation, I additionally control for this aspect.

For my experimental variable, I include *CRISIS* to test for a relationship between disclosure and crisis. For hypothesis H1 and H2a, I predict a negative coefficient, for H3 the expected sign is unclear.

3.4.2 Measurement of the Dependent Variables

3.4.2.1 Quality and Scope Indices

Measuring quality is a challenge as there is no standardized and widely accepted definition. Furthermore, no consistent rules for the measurement exist. Wallace and Naser (1995) explain that “financial disclosure is an abstract concept” (p. 326) which makes it even more difficult to measure quality directly. Thus, quality indices provide an indirect and in some way subjective summary quality measure which are well established in accounting and business research (Ahmed and Courtis 1999; Healy and Palepu 2001). Imhoff (1992) defines quality as “the overall subjective assessment of the relevance, reliability and comparability of the accounting data produced by the reporting entity – in essence the relative usefulness of the data, and analyses based on the data” (p. 101). Other key factors important for guaranteeing a minimum of quality are completeness, accuracy and reliability (Singhvi and Desai 1971). Wallace and Naser (1995) classify existing disclosure quality studies in five categories according to whether the information measured in the annual reports is adequate, informative, timely, understandable or comprehensive. The last aspect means that one firm provides more detailed information than another firm without overlooking important aspects of information.

In my study the focus is on comprehensiveness in the sense of companies providing more and better disclosure in their forward-looking report, hence providing a better level of information to the users of the report. The measurement of disclosure is assessed either by using a self-constructed index (Botosan 1997; Drake et al. 2009; Lang and Lundholm 1993; Petersen and Plenborg 2006) or by

taking an existing index. Existing, well-known indices used to proxy disclosure quality and quantity are e.g. the AIMR or FAF index.⁴⁰

I use content analysis to operationalize and measure the quality and scope of forward-looking reports. The texts of the forward-looking reports are manually analyzed and coded according to a previously developed coding scheme and later aggregated to an overall score (Boyatzis 1998). My quality and scope disclosure indices will concentrate on company-specific forecasts released by firms, not information gathered by other institutions.⁴¹ I follow earlier approaches, and group the items into three categories: company environment, company-specific forecasts, and other disclosure items (for a detailed list, see Appendix 2). Next, I distinguish between the quality and scope indices because their weighting is different. Quality is a weighted index, scope an unweighted one. The weighting of items is based on the ex ante precision, weighting quantitative information more heavily (Botosan 1997).⁴²

Quality Index

The quality index (*QUAL*) consists of the following three categories.⁴³

- The first category consists of expected prospects for the economy and the industry. I analyze dichotomously whether the company included such a forecast, with a score equal to 1 if a forecast was included, and 0 otherwise.
- The second category considers qualitative and quantitative company-specific forecasts such as, e.g., strategy, revenue, or earnings forecasts.
 - I distinguish between items coded dichotomously (e.g., did the company change its operating policies?)

⁴⁰ For a more detailed description of self-constructed indices, see section 2.2.1 and for existing indices, see section 2.2.2.

⁴¹ The reason is that most numbers regarding company environment are based on forecasts of economic research institutes, and can be obtained elsewhere as well.

⁴² For more details concerning the construction of the indices, see section 2.3.3.1.

⁴³ For more details concerning the quality index construction, see section 2.3.3.1.1

- and items such as ratios (e.g., earnings forecasts), which are coded along three different dimensions, as follows:
 - Forecast horizon (undisclosed, one-year, two-year, intermediate-term, long-term).⁴⁴
 - Ex ante forecast precision (undisclosed, qualitative, comparative, minimum/maximum, vague range, bound range, point).
 - Economic direction (undisclosed, positive, negative, equal) of future development.
- The third category encompasses other items (again dichotomously), such as whether an overall conclusion is given, or whether major assumptions are reported.

Finally, I combine the scores from all three categories to obtain an overall score for each company and year.

Scope Index

As mentioned before, the scope (*SCOPE*) index is based on the same items as the quality index. However, in contrast to the quality score, the scope index only distinguishes between information that is present or absent by assigning dichotomous variables. The previously described weights for ex ante precision and economic direction are not relevant here; it is only important to note whether the item was reported in the forward-looking-report. The unweighted quality index is a proxy for reported scope, because it only measures the number of items disclosed.

3.4.2.2 Quantity

The quantity (*QUAN*) is captured by measuring the total number of words of the forward-looking report of each company. Taking the number words, rather than

⁴⁴ Intermediate-term refers to a three- to five-year forecast horizon; long-term refers to a six- to ten-year forecast horizon.

number of pages or sentences into account has the advantage that different layouts, type, size etc. of the reports won't distort the result.

3.4.2.3 Validity and Reliability

Validity and reliability are important constructs in content analysis because it is assumed that replicable and valid inferences will be drawn from the text (Krippendorff 2004; Weber 1990). The precautions and measures that are used to guarantee higher levels of objectivity, validity, and reliability of the constructed indices are summarized in section 2.3.4.

3.4.3 Sample

The study is conducted for the years 2005 to 2009 based on the BilReG regulations, which have been applicable since 2005. The study population consists of the same sample described in section 2.3.2.

	Companies	Firm years
Analyzed forward-looking reports	123	579
Availability of the <i>CHS</i> and <i>VOLA</i> variables	-25	-129
Going concern assumption	0	-8
Total Sample	98	442

Table 7: Sample

From the full sample of 579 analyzed annual reports (see also section 2.3.2), I further reduce the number due to data availability. I only include firms with data for the dependent, independent, and control variables. As illustrated in Table 7 for the closely held shares and volatility variables, I have missing values. Due to extreme negative values for the variable profitability I remove eight companies in order not to violate the going concern assumption. Thus, the final sample comprises 442 firm years.

3.5 Empirical Results

3.5.1 Descriptive Statistics

Table 8 shows the comparison of the mean, median, minimum and maximum of the total disclosure quality, scope index and the quantity measure for each year.

The mean quality and scope disclosure index was 25.45 and 14.40 in 2005 and increased to 31.89 and 18.04 in 2007 respectively and decreased to 23.39 and 14.54 in 2008 respectively, whereby in 2009 both indices increased to 28.12 and 16.63. For the quality index, the score in 2008 was significantly lower than in 2005, for the scope index, the reporting level remained almost the same and not significant.

	Year	N	Mean	Median	Minimum	Maximum
QUAL_{jt}						
	2005	96	25.45	23.0	3	79
	2006	116	29.69	27.5	1	137
	2007	122	31.89	28.0	1	135
	2008	123	23.39	21.0	0	129
	2009	122	28.12	26.8	5	95
SCOPE_{jt}						
	2005	96	14.40	13.0	1	38
	2006	116	16.60	16.0	1	48
	2007	122	18.04	17.0	1	50
	2008	123	14.54	13.0	0	51
	2009	122	16.63	15.5	1	52
QUAN_{jt}						
	2005	96	1,155	925	203	3,673
	2006	116	1,258	994	171	4,690
	2007	122	1,447	1,242	138	4,976
	2008	123	1,584	1,467	59	5,166
	2009	122	1,812	1,533	138	5,010

Notes. This table shows the distribution of the different forward-looking disclosure indices: quality, scope and quantity per year. I define the variables as follows: $QUAL_{jt}$ = firm j 's year t absolute forward-looking disclosure quality index; $SCOPE_{jt}$ = firm j 's year t absolute forward-looking disclosure scope index; and $QUAN_{jt}$ = firm j 's year t absolute forward-looking disclosure quantity measure.

Table 8: Voluntary Forward-looking Disclosure Indices Across Years

I also undertook paired t-test year by year and the results are presented in Table 9, which shows that the means differ significantly between years. Both *QUAL* and *SCOPE* significantly increased up to 2007 then decreased in 2008, followed by a significant increase in 2009. This result shows that during the crisis period forward-looking quality and scope disclosure significantly deteriorated. In contrast, the mean quantity measure shows an increase of volume in all years from 1,155 words in 2005 to 1,812 words in 2009, implying that companies still report

in terms of quantity during crisis times. However the increase is a little lower than in the year before and the year after crisis.

	QUAL _{jt}		SCOPE _{jt}		QUAN _{jt}	
	Paired t-test		Paired t-test		Paired t-test	
	t-statistic	p-value	t-statistic	p-value	t-statistic	p-value
2005 vs. 2006	-4.758	0.000	-5.176	0.000	-3.577	0.001
2006 vs. 2007	-2.146	0.034	-2.803	0.006	-4.176	0.000
2007 vs. 2008	7.246	0.000	6.032	0.000	-2.663	0.009
2008 vs. 2009	-4.685	0.000	-3.607	0.001	-4.822	0.000

Notes. This table shows paired t-test year by year for the changes in disclosure quality, scope and quantity respectively. I define the variables as follows: QUAL_{jt} = firm j's year t absolute forward-looking disclosure quality index; SCOPE_{jt} = firm j's year t absolute forward-looking disclosure scope index; and QUAN_{jt} = firm j's year t absolute forward-looking disclosure quantity measure

Table 9: Different Disclosure Indices Over Time

Panel A of Table 10 shows the descriptive statistics for my entire sample. The pooled mean (median) disclosure level over the whole sample period for the quality index is 29.05 (26.00), a mean of 16.75 (15.00) for the scope index, respectively. For the quantity measure the mean (median) reported number of words is 1,533.11 (1,282.00) and the difference between minimum and maximum forward-looking reporting length is quite large, varying between 98 and 5,166 words. For the independent variables *SIZE* has a mean (median) value of 14.66 (14.34). Inside ownership (*CHS*) has a (median) value of 0.35 (0.31), which suggest a significantly proportion of share ownership is held by insiders in German companies. The mean leverage (*LEV*) ratio of 22.67% indicates a low proportion of total assets being funded by creditors. The average 13.56% return on equity ratio shows German companies have over years generated a healthy return to shareholders but the volatility of their returns (*VOLA*) had been high around 0.67 with a standard deviation of 2.42, and some companies experienced extreme volatility, as indicated by the maximum value of 26.09. The *AUD* variable with a mean value of .79 out of 442 companies indicates that 349 out of 442 firm-year observations employed a Big4 audit firm.

Panel B and C of Table 10 show the descriptive statistics for the crisis and non-crisis period. The number of observations for crisis period is 93 and 349 for non-crisis periods. The mean (median) level of *QUAL* for crisis is 24.69 (21.00) and 30.21 (27.00) for non-crisis. For *SCOPE* the same pattern is observable, whereas the difference between mean (median) level of crisis 15.32 (14.00) and non-crisis 17.13 (16.00) is less. For the variable *QUAN* the picture is different. During crisis period, the mean (median) reporting volume is higher 1,674 (1,490) than in non-crisis periods 1,496 (1,208). These results indicate that disclosure quality decreases strongly due to crisis, whereas disclosure scope only decreases slightly. Disclosure quantity in contrast increases in the crisis period, implying that companies still report in terms of volume.

	N	Mean	Std.Dev.	Median	Minimum	Maximum
Panel A: Full sample						
QUAL _{jt}	442	29.05	20.25	26.00	0.00	137.00
SCOPE _{jt}	442	16.75	9.76	15.00	0.00	52.00
QUAN _{jt}	442	1,533.11	1,046.67	1,282.00	98.00	5,166.00
SIZE _{jt}	442	14.66	1.89	14.34	11.09	19.38
CHS _{jt}	442	0.35	0.24	0.31	0.00	0.93
LEV _{jt}	442	22.67	15.81	21.98	0.00	71.97
ROE _{jt}	442	13.56	15.60	13.75	-47.24	98.67
VOLA _{jt}	442	0.67	2.42	0.16	0.00	26.09
AUD _{jt}	442	0.79	0.40	1.00	0.00	1.00
CRISIS _t	442	0.21	0.41	0.00	0.00	1.00
Panel B: Crisis period, CRISIS_t=1						
QUAL _{jt}	93	24.69	19.53	21.00	0.00	129.00
SCOPE _{jt}	93	15.32	9.86	14.00	0.00	51.00
QUAN _{jt}	93	1,674.01	1,082.93	1,490.00	98.00	5,166.00
SIZE _{jt}	93	14.74	1.90	14.41	11.30	19.38
CHS _{jt}	93	0.37	0.26	0.37	0.00	0.93
LEV _{jt}	93	23.77	17.21	22.08	0.00	71.97
ROE _{jt}	93	13.31	15.80	14.21	-47.24	65.78
VOLA _{jt}	93	0.76	2.84	0.11	0.00	24.64
AUD _{jt}	93	0.78	0.41	1.00	0.00	1.00
Panel C: Non-crisis period, CRISIS_t=0						
QUAL _{jt}	349	30.21	20.31	27.00	1.00	137.00
SCOPE _{jt}	349	17.13	9.71	16.00	1.00	52.00
QUAN _{jt}	349	1,495.56	1,035.15	1,208.00	138.00	5,010.00
SIZE _{jt}	349	14.64	1.89	14.30	11.09	19.27
CHS _{jt}	349	0.34	0.24	0.31	0.00	0.93
LEV _{jt}	349	22.38	15.43	21.95	0.00	68.97
ROE _{jt}	349	13.63	15.57	13.65	-37.61	98.67
VOLA _{jt}	349	0.65	2.30	0.17	0.00	26.09
AUD _{jt}	349	0.80	0.40	1.00	0.00	1.00

Notes. This table shows the descriptive statistics for all dependent, independent, and control variables.

I define the variables as follows: QUAL_{jt} = firm j's year t absolute forward-looking disclosure quality index; SCOPE_{jt} = firm j's year t absolute forward-looking disclosure scope index; QUAN_{jt} = firm j's year t absolute forward-looking disclosure quantity measure; SIZE_{jt} = the log of firm j's total assets at the end of fiscal year t; CHS_{jt} = firm j's percentage of equity owned by the insiders to all equity of the firm at the end of fiscal year t; LEV_{jt} = firm j's total debt divided by the total

assets at the end of fiscal year t ; ROE_{jt} = firm j 's return on equity (net income before preferred dividends - preferred dividend requirement) / average of last year's and current year's common equity * 100) at the end of fiscal year t ; $VOLA_{jt}$ = variance of total shareholder return over the last five years of firm j for fiscal year t ; AUD_{jt} = an indicator variable equal to 1 if firm j is audited by a Big4 company for fiscal year t , and 0 otherwise; and $CRISIS_t$ = is an indicator variable, equal to 1 if the fiscal year t is considered to be crisis year (2008), 0 otherwise (2005-2007 and 2009).

Table 10: Descriptive Statistics

Table 11 and Table 12 show the Pearson and Spearman coefficients of correlations between the dependent and independent variables. The correlation among the dependent variables shows significantly high Pearson (Spearman) correlations 0.919 (0.920) between quality and scope. This is not surprising as both indices are based on the same items differing only in the weighting. However, the relationship between quantity and quality and scope is lower for Pearson (Spearman) at $p=0.565$ (0.540) and $p=0.625$ (0.601), respectively.

The correlations between the dependent and the independent variables show that the quality as well as scope and quantity have a significant correlation with firm size which supports the hypothesis that a higher forward-looking disclosure quality, scope and quantity level is associated with a large firm size.

The correlations between the independent variables indicate significant relationships between firm size and most of the other variables. The highest correlation between the independent variables for the Pearson correlation is between firm size (*SIZE*) and Big4 audit firm (*AUD*) with a p of 0.377, followed by $p=0.291$ between *SIZE* and *LEV*. For the Spearman correlation the highest values are between *SIZE* and *VOLA* with a p of 0.407 and between *SIZE* and *LEV* with a p of 0.314. These results indicate that multicollinearity is not a problem as correlations between the independent variables with a value between 0.8-0.9 are considered to be harmful (Kennedy 2008).

	QUAL _{jt}	SCOPE _{jt}	QUAN _{jt}	SIZE _{jt}	CHS _{jt}	LEV _{jt}	ROE _{jt}	VOLA _{jt}	AUD _{jt}
SCOPE _{jt}	0.919***								
QUAN _{jt}	0.565***	0.625***							
SIZE _{jt}	0.168***	0.265***	0.360***						
CHS _{jt}	-0.055	-0.050	-0.180***	-0.083*					
LEV _{jt}	0.032	0.026	0.157***	0.291***	-0.027				
ROE _{jt}	-0.018	-0.022	-0.150***	-0.072	0.077	-0.100**			
VOLA _{jt}	-0.145***	-0.157***	-0.107**	-0.166***	-0.062	-0.038	0.034		
AUD _{jt}	0.030	0.155***	0.168***	0.377***	-0.047	0.062	-0.113**	-0.022	
CRISIS _t	-0.111**	-0.076	0.070	0.020	0.056	0.036	-0.008	0.019	-0.011

Notes. This table shows the Pearson correlations between the dependent and independent variables.

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: QUAL_{jt} = firm j's year t absolute forward-looking disclosure quality index; SCOPE_{jt} = firm j's year t absolute forward-looking disclosure scope index; QUAN_{jt} = firm j's year t absolute forward-looking disclosure quantity index; SIZE_{jt} = the log of firm j's total assets at the end of fiscal year t; CHS_{jt} = firm j's percentage of equity owned by the insiders to all equity of the firm at the end of fiscal year t; LEV_{jt} = firm j's total debt divided by the total assets at the end of fiscal year t; ROE_{jt} = firm j's return on equity (net income before preferred dividends - preferred dividend requirement) / average of last year's and current year's common equity * 100) at the end of fiscal year t; VOLA_{jt} = variance of total shareholder return over the last five years of firm j for fiscal year t; AUD_{jt} = an indicator variable equal to 1 if firm j is audited by a Big4 company for fiscal year t, and 0 otherwise; and CRISIS_t = is an indicator variable, equal to 1 if the fiscal year t is considered to be crisis year (2008), 0 otherwise (2005-2007 and 2009).

Table 11: Pearson Correlation Matrix

	QUAL _{jt}	SCOPE _{jt}	QUAN _{jt}	SIZE _{jt}	CHS _{jt}	LEV _{jt}	ROE _{jt}	VOLA _{jt}	AUD _{jt}
SCOPE _{jt}	0.920***								
QUAN _{jt}	0.540***	0.601***							
SIZE _{jt}	0.231***	0.335***	0.422***						
CHS _{jt}	-0.044	-0.056	-0.165***	-0.063					
LEV _{jt}	0.074	0.067	0.197***	0.314***	-0.051				
ROE _{jt}	-0.052	-0.048	-0.232***	-0.100**	0.044	-0.124***			
VOLA _{jt}	-0.054	-0.060	-0.065	-0.407***	-0.073	-0.132***	0.073		
AUD _{jt}	0.078	0.189***	0.227***	0.397***	-0.051	0.064	-0.121**	-0.136***	
CRISIS _t	-0.139***	-0.093*	0.083*	0.023	0.054	0.025	-0.001	-0.135***	-0.012

Notes: This table shows the Spearman correlations between the dependent and independent variables.

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: QUAL_{jt} = firm j's year t absolute forward-looking disclosure quality index; SCOPE_{jt} = firm j's year t absolute forward-looking disclosure quantity index; QUAN_{jt} = firm j's year t absolute forward-looking disclosure quantity index; SIZE_{jt} = the log of firm j's total assets at the end of fiscal year t; CHS_{jt} = firm j's percentage of equity owned by the insiders to all equity of the firm at the end of fiscal year t; LEV_{jt} = firm j's total debt divided by the total assets at the end of fiscal year t; ROE_{jt} = firm j's return on equity (net income before preferred dividends - preferred dividend requirement) / average of last year's and current year's common equity * 100) at the end of fiscal year t; VOLA_{jt} = variance of total shareholder return over the last five years of firm j for fiscal year t; AUD_{jt} = an indicator variable equal to 1 if firm j is audited by a Big4 company for fiscal year t, and 0 otherwise; and CRISIS_t is an indicator variable, equal to 1 if the fiscal year t is considered to be crisis year (2008), 0 otherwise (2005-2007 and 2009).

Table 12: Spearman Correlation Matrix

3.5.2 Results

The results of the pooled regression are presented in Table 13.⁴⁵ I observe that quality (*QUAL*) is positively significantly ($p < 0.01$) associated with *SIZE*, with coefficient (t-statistic) of 1.477 (2.97). The result of a significant value of firm size is consistent with the results of Barth's and Wasser's study of the German market. *VOLA* (volatility of share return) is negatively significantly ($p < 0.01$) associated with *QUAL*, with coefficient (t-statistic) of -0.875 (-5.31). Both variables are in the expected direction. In the base model, no other variables are significant. When *CRISIS* is added to model 1, it becomes significant ($p < 0.05$) with coefficient (t-statistic) of -5.610 (-2.49) and all other variables remained unchanged in direction and significance levels, supporting hypothesis 1.

Including *CRISIS* in the scope model *SIZE* and *VOLA* are still significant and other variables remain unchanged. The coefficient (t-statistic) on *SIZE* and *VOLA* is 1.026 (4.36) and -0.388 (-4.29) respectively. The variable *CRISIS* is significantly negative ($p < 0.10$), supporting hypothesis 2a.

⁴⁵ Having observations of the same companies for different years, it is very possible that the scores within each firm may not be independent, and this could lead to residuals that are not independent within companies. Consequently, I use a clustered regression in order to adjust for firm-specific correlation (see also Li 2010). To address the assumption of multicollinearity I use the variance inflation factor (VIF). It does not exceed 10 in any case, indicating no multicollinearity (Wooldridge 2009).

$$DISC_{jt} = \beta_0 + \beta_1 SIZE_{jt} + \beta_2 CHS_{jt} + \beta_3 LEV_{jt} + \beta_4 ROE_{jt} + \beta_5 VOLA_{jt} + \beta_6 AUD_{jt} + \sum_{k=1}^8 \alpha_k \beta_7 IND_j + \beta_8 CRISIS_t + \varepsilon_{jt}$$

Variable	Exp. Sign	Model 1		Model 2		Model 3	
		QUAL _{jt} (N = 442)	QUAL _{jt} (N = 442)	SCOPE _{jt} (N = 442)	SCOPE _{jt} (N = 442)	QUAN _{jt} (N = 442)	QUAN _{jt} (N = 442)
Intercept		23.892*** (2.59)	24.185*** (2.63)	5.863 (1.42)	5.963 (1.45)	-543.910 (-1.13)	-552.619 (-1.15)
SIZE _{jt}	+	1.477*** (2.97)	1.509*** (3.07)	1.015*** (4.27)	1.026*** (4.36)	166.072*** (6.39)	165.116*** (6.37)
CHS _{jt}	-	-1.833 (-0.44)	-1.068 (-0.26)	1.066 (0.53)	1.326 (0.66)	-306.156 (-1.56)	-328.875* (-1.67)
LEV _{jt}	?	-0.048 (-0.95)	-0.042 (-0.85)	-0.040 (-1.63)	-0.038 (-1.56)	4.207 (1.63)	4.046 (1.56)
ROE _{jt}	?	0.007 (0.14)	0.005 (0.10)	0.000 (0.02)	-0.000 (-0.01)	-8.928*** (-2.91)	-8.872*** (-2.88)
VOLA _{jt}	-	-0.875*** (-5.31)	-0.849*** (-4.96)	-0.397*** (-4.60)	-0.388*** (-4.29)	-19.426 (-1.22)	-20.190 (-1.25)
AUD _{jt}	+	-1.414 (-0.46)	-1.537 (-0.50)	1.749 (1.40)	1.707 (1.36)	68.146 (0.57)	71.796 (0.61)
CRISIS _t	-/? ⁴⁶		-5.610** (-2.49)		-1.912* (-1.74)		166.686 (1.43)
Industry fixed effects		yes		yes		yes	
R ²		8.3%	9.6%	14.4%	15.0%	21.7%	22.1%
Adj. R ²		5.5%	6.6%	11.8%	12.2%	19.3%	19.6%

Notes. This table shows the OLS analysis for forward-looking disclosure and its determinants.

For the multivariate analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity-robust and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: QUAL_{jt} = firm j's year t absolute forward-looking disclosure quality index; SCOPE_{jt} = firm j's year t absolute forward-looking disclosure scope index; QUAN_{jt} = firm j's year t absolute forward-looking disclosure quantity measure; SIZE_{jt} = the log of firm j's total assets at the end of fiscal year t; CHS_{jt} = firm j's percentage of equity owned by the insiders to all equity of the firm at the end of fiscal year t; LEV_{jt} = firm j's total debt divided by the total assets at the end of fiscal year t; ROE_{jt} = firm j's return on equity (net income before preferred dividends - preferred dividend requirement) / average of last year's and current year's common equity * 100) at the end of fiscal year t; VOLA_{jt} = variance of total shareholder return over the last five years of firm j for fiscal year t; AUD_{jt} = an indicator variable equal to 1 if firm j is audited by a Big4 company for fiscal year t, and 0 otherwise; and CRISIS_t = is an indicator variable, equal to 1 if the fiscal year t is considered to be crisis year (2008), 0 otherwise (2005-2007 and 2009).

Table 13: The Relation between Disclosure and its Determinants

⁴⁶ For the quality and scope models the association between disclosure and crisis is expected to be negative. For the relation between quantity and crisis the direction is unclear.

To provide evidence that crisis has a stronger impact on the quality index than on the scope index, a non-parametric test is conducted which shows the difference is significant ($\chi^2 = 17$, $p < 0.01$), suggesting that *CRISIS* had a stronger negative effect on *QUAL* than on *SCOPE*, supporting hypothesis 2b. Additionally, I use the obtained quality, scope values respectively of 2008 as a benchmark. I subtract the yearly quality (scope) values for each firm from the benchmark. I observe a mean difference for quality of -4.08 and of -1.42 for scope. This means that for quality, the values in 2008 are to a higher extent lower compared to other years than for scope. I then run a t-test which confirms a statistical significant difference between the quality and scope values, showing that crisis has a different impact on quality and scope. These results support my hypothesis.

Model 3 shows significant coefficients for the firm size and return on equity in both variations. The coefficient (t-statistic) on *SIZE* is 166.072 (6.39) is positively significant while *ROE* is negatively significant -8.928 (-2.91). With including the variable *CRISIS* in model 3 no changes have been observed, indicating that there is no difference in the reported volume between crisis and non-crisis years. Compared to the other two models, in model 3 less profitable firms and firms with a low percentages of shares held by insiders have more voluminous forward-looking reports. A possible explanation for the negative relationship between quantity and return on equity in model 3 is that companies with a low return on equity tend to disclose more information in terms of quantity rather than in terms of quality and scope (see model 1 and 2), indicating that these firms try to conceal their low return on equity by reporting more volume. The low significant negative relationship between closely held shares and quantity confirms the hypothesis, that the lower the proportion of company insider, the higher the extent of disclosure.

For the base version of each model, without including the crisis variable, a R^2 of 8.3% is obtained for the quality model, a R^2 of 14.4% for the scope model and a R^2 of 21.7% for the quantity model. Extending the base model by the crisis

variable the R^2 for model 1 is 9.6% and 15.0% for model 2, indicating that by using model 2 – the scope index as the dependent variable- the independent variables can explain more of the total variance of the dependent variable. Nevertheless, compared to prior disclosure studies the R^2 is rather low. For model 3 the R^2 is 22.1%, which is higher compared to the other two indices, showing a higher explanatory power of the independent variables in model 3. All models are significant.

3.5.3 Sensitivity Analysis

3.5.3.1 Winsorizing and Removing Outliers

To control for extreme values, all variables are winsorized at the 1% (see Appendix 4a) and 5% (see Appendix 4b) level. In the case of the quality model winsorizing at the 1% and at the 5% level leads to a more significant association between *QUAL_W1/5* and *CRISIS_W1/5* with coefficient (t-statistic) of -5.688 (-2.76) and -5.187 (-2.95). Winsorizing the scope model at the 1% level does not affect the coefficient of *CRISIS_W1*. For the 5% level, the association improves, with coefficient (t-statistic) of -1.970 (-2.13). Winsorizing the quantity model on the 1% and the 5% level does not change the original results. By excluding six severe outliers in model 1, one severe outlier in model 2 and two severe outliers in model 3 the variables that have been significant before are still significant in all models, indicating that the models are not sensitive to winsorizing and removing of outliers.

3.5.3.2 Panel Data Structure

The data contain observations of the same companies over different years (2005-2009), so a panel structure exists⁴⁷. By using panel data, unobservable company specific and time specific influences imply that the observations may not be distributed independently over time. Unobservable variables that change over time but not within the company might be of influence as well as unobservable

⁴⁷ For details concerning panel data and the usage of the fixed and random effects model, see (Petersen 2009).

measures like cultural factors within the different companies. In my case, it is likely, that each company has a specific unobservable reporting behavior which should be addressed adequately. For this reason, to consider firm specific effects, the fixed effect or random effect model can be applied. In my case, it might be more likely to have fixed effects, effects within the company that have an impact on the outcome variables. However, the considered time-horizon is rather short and the changes and variations in the variables might be too small to be captured by the fixed effect model. Furthermore, differences across the firms might also have an impact on the dependent variables, which in turn, supports the random effect model. To address this issue, a Hausman test is applied in order to determine the appropriate model. The test indicates that the random effects model is the preferred one. Table 14 shows the results for the panel analysis using the random effects model. In model 1 and 2 the same independent variables show significant coefficients as in the pooled regression models. In addition, the variable return on equity is slightly significant. In model 3 the variable crisis is positively significant and the variable closely held shares is not significant anymore, which indicate that during the crisis (2008) period German companies even increased quantity of forward-looking disclosures while reducing their quality and scope.

Appendix 4c also provides the results for a fixed effects model. In the fixed effects model, the *CRISIS* coefficient shows the same significant results as in the random effects model for model 1 and model 2. For model 3, the coefficient is still significant, however a little less. The other variables do not vary to a great extent compared to the random effects model.

$$DISC_{jt} = \beta_0 + \beta_1 SIZE_{jt} + \beta_2 CHS_{jt} + \beta_3 LEV_{jt} + \beta_4 ROE_{jt} + \beta_5 VOLA_{jt} + \beta_6 AUD_{jt} + \sum_{k=1}^8 \alpha_k \beta_7 IND_j + \beta_8 CRISIS_t + \varepsilon_{jt}$$

Variable	Exp. Sign	Model 1		Model 2		Model 3	
		QUAL _{jt}	SCOPE _{jt}	QUAL _{jt}	SCOPE _{jt}	QUAN _{jt}	QUAN _{jt}
Intercept	?	19.953 (1.34)	12.409 (0.83)	2.077 (0.31)	-0.428 (-0.06)	-2,287.684** (-2.57)	-2,083.862** (-2.37)
SIZE _{jt}	+	1.141 (1.40)	1.584* (1.95)	1.104*** (2.86)	1.255*** (3.28)	226.754*** (4.64)	214.895*** (4.49)
CHS _{jt}	-	-4.815 (-1.00)	-2.932 (-0.63)	-0.061 (-0.03)	0.619 (0.28)	371.501 (1.53)	321.777 (1.32)
LEV _{jt}	?	-0.054 (-0.74)	-0.033 (-0.46)	-0.031 (-0.80)	-0.023 (-0.61)	4.213 (1.09)	3.750 (0.96)
ROE _{jt}	?	0.080* (1.75)	0.082* (1.76)	0.040* (1.74)	0.041* (1.73)	-5.542*** (-2.78)	-5.583*** (-2.76)
VOLA _{jt}	-	-0.401*** (-3.12)	-0.350** (-2.58)	-0.273*** (-4.92)	-0.256*** (-4.83)	-6.529 (-1.24)	-7.598 (-1.34)
AUD _{jt}	+	2.686 (0.74)	2.214 (0.60)	1.561 (1.08)	1.337 (0.94)	119.065 (0.74)	131.452 (0.83)
CRISIS _t	-/? ⁴⁸		-5.454*** (-4.97)		-1.992*** (-3.43)		123.287** (2.39)
Number of groups		98		98		98	

Notes. This table shows a random effects analysis for forward-looking disclosure and its determinants.

For the random effects analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity-robust. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: QUAL_{jt} = firm j's year t absolute forward-looking disclosure quality index; SCOPE_{jt} = firm j's year t absolute forward-looking disclosure scope index; QUAN_{jt} = firm j's year t absolute forward-looking disclosure quantity measure; SIZE_{jt} = the log of firm j's total assets at the end of fiscal year t; CHS_{jt} = firm j's percentage of equity owned by the insiders to all equity of the firm at the end of fiscal year t; LEV_{jt} = firm j's total debt divided by the total assets at the end of fiscal year t; ROE_{jt} = firm j's return on equity (net income before preferred dividends - preferred dividend requirement) / average of last year's and current year's common equity * 100) at the end of fiscal year t; VOLA_{jt} = variance of total shareholder return over the last five years of firm j for fiscal year t; AUD_{jt} = an indicator variable equal to 1 if firm j is audited by a Big4 company for fiscal year t, and 0 otherwise; and CRISIS_t = is an indicator variable, equal to 1 if the fiscal year t is considered to be crisis year (2008), 0 otherwise (2005-2007 and 2009).

Table 14: Panel Structure: Random Effects Model

⁴⁸ For the quality and scope models the association between disclosure and crisis is expected to be negative. For the relation between quantity and crisis the direction is unclear.

3.5.3.3 Different Specifications of the Dependent Variable Quality

In order to test the robustness of the quality index, different specifications are used. First, the index is weighted differently. As already discussed earlier, there are various views whether point or range forecasts should be weighted higher. To test the sensitivity of the results, a different weighting for point forecasts and bound-range forecasts is used (*QUAL_W2*) in which the weight assigned is 5 for a point forecast and 4 for a bound-range forecast. The results (see Appendix 4d) remained unchanged. While using *QUAL_W2*, *CRISIS* is still significant with coefficient (t-statistic) of -5.761 (-2.37).

The second sensitivity check employed is the usage of a specific part of the quality index. I therefore only use company specific, quantifiable information (*QUAL_CS*). Information of category I and category III were completely excluded as well as non-quantifiable information of category II.⁴⁹ *CRISIS* shows a more significant impact on the company-specific quantifiable information with coefficient (t-statistic) of -5.640 (-2.65).

3.5.3.4 Different Specifications of the Independent Variable Crisis

I test different definitions of the crisis variable in line with arguments that the effect of the GFC was felt beyond 2008. Hence, I use the indicator *CRISIS_2* which is a binary variable that equals 1 in the years 2008 and 2009 (instead of 2008 in my main model) and 0 for the years 2005-2007. The results (see Appendix 4e) show the same significance levels for the quality model. For the scope model *CRISIS_2* variable is not significant. This implies that additionally including 2009 as year of crisis does not affect the scope. Considering the quantity model it is observed that the quantity is significantly higher in crisis time if 2009 is also considered as period of crisis. The differences in results can also be explained by the number of observations defined as crisis. For crisis is 2008 the

⁴⁹ For details of the different categories, see section 2.3.3.1.1 and Appendix 2.

percentage of crisis variable is 21.04 per cent of all firm-year observations, whereas it is 42.08 per cent when both 2008 and 2009 are grouped under crisis.

The second sensitivity measure used for crisis is to apply a company specific crisis indicator. The crisis indicator *CRISIS_R* is a binary variable taking the value of 1 if the firm's revenue decreased from one to the next year and takes the value of 0 otherwise. The *CRISIS_R* is still negative and significant for the quality model and insignificant for the quantity model respectively. For the scope model a change compared to the original definition of crisis can be observed, showing a non-significant coefficient for *CRISIS_R*. The difference might be due to the consideration of company specific decrease in revenues showing that a decrease in revenues does not affect the scope of forward-looking reporting. This implies that the company specific measure only affects the quality but not the scope and volume.

3.5.4 Do Lagged Variables Affect the Results?

To additionally test whether a firm's prior forward-looking reporting behavior influences a firm's present reporting, I introduce firm's lagged variables of the firm's three disclosure indices in $t-1$, into the models. Table 15 documents high Spearman and Pearson correlations between the disclosure indices with those of the prior year.

	QUAL _{jt}	QUAL _{l_{jt-1}}	SCOPE _{jt}	SCOPE _{l_{jt-1}}	QUAN _{jt}
Panel A: Pearson Correlation					
QUAL _{l_{jt-1}}	0.796***				
SCOPE _{jt}	0.919***	0.742***			
SCOPE _{l_{jt-1}}	0.728***	0.925***	0.777***		
QUAN _{jt}	0.565***	0.509***	0.625***	0.567***	
QUAN _{l_{jt-1}}	0.527***	0.574***	0.593***	0.644***	0.881***
Panel B: Spearman Correlation					
QUAL _{l_{jt-1}}	0.716***				
SCOPE _{jt}	0.925***	0.688***			
SCOPE _{l_{jt-1}}	0.666***	0.923***	0.727***		
QUAN _{jt}	0.537***	0.455***	0.601***	0.531***	
QUAN _{l_{jt-1}}	0.477***	0.558***	0.539***	0.634***	0.840***

Notes. This table shows the Person correlations in Panel A and the Spearman correlations in Panel B among the dependent variables and the lagged dependent variables.

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: QUAL_{jt} = firm j's year t absolute forward-looking disclosure quality index; QUAL_{l_{jt-1}} = firm j's year t-1 absolute forward-looking disclosure quality index; SCOPE_{jt} = firm j's year t absolute forward-looking disclosure scope index; SCOPE_{l_{jt-1}} = firm j's year t-1 absolute forward-looking disclosure scope index; QUAN_{jt} = firm j's year t absolute forward-looking disclosure quantity measure; QUAN_{l_{jt-1}} = firm j's year t-1 absolute forward-looking disclosure quantity measure.

Table 15: Correlation Dependent Variables and Lagged Variables

Table 16 shows that adding lagged values of the dependent variables into the models yields highly significant coefficients on those lagged dependent variables, consistent with the univariate correlations. I note that quality and scope appear less “sticky”, i.e. are to a lesser degree serially correlated, indicating greater reactivity to changing circumstances. Also, the coefficient for my variable of interest, *CRISIS*, remains significantly negative and becomes even stronger for quality and scope, suggesting that the quality and scope of forecast reports is decreased in times of crisis even when past quality and scope are controlled for. Overall, the R² is considerably higher by introducing the lagged variables in the models, indicating that the disclosure behavior of year t is influenced by the disclosure level of the prior year (t-1). Multicollinearity is tested with the variance inflation factor, denoting no problem as the variance inflation factor is below ten for all variables (Wooldridge 2009).

$$DISC_{jt} = \beta_0 + \beta_1 SIZE_{jt} + \beta_2 CHS_{jt} + \beta_3 LEV_{jt} + \beta_4 ROE_{jt} + \beta_5 VOLA_{jt} + \beta_6 AUD_{jt} + \sum_{k=1}^8 \alpha_k \beta_7 IND_j + \beta_8 CRISIS_t + \beta_8 DISC_{jt-1} + \varepsilon_{jt}$$

Variable	Exp. Sign	Model 1	Model 2	Model 3
		QUAL _{jt} (N = 357)	SCOPE _{jt} (N = 357)	QUAN _{jt} (N = 357)
Intercept	?	1.729 (0.23)	1.341 (0.35)	-125.436 (-0.41)
SIZE _{jt}	+	0.418 (1.01)	0.272 (1.24)	41.402** (2.15)
CHS _{jt}	-	-0.321 (-0.11)	0.073 (0.05)	-55.221 (-0.39)
LEV _{jt}	?	-0.017 (-0.41)	-0.012 (-0.56)	-0.421 (-0.24)
ROE _{jt}	?	-0.012 (-0.30)	0.004 (0.20)	-2.663 (-1.43)
VOLA _{jt}	-	0.075 (0.38)	0.058 (0.57)	8.803 (0.90)
AUD _{jt}	+	-1.738 (-0.93)	-0.701 (-0.78)	-50.301 (-0.82)
CRISIS _t	-/? ⁵⁰	-11.705*** (-7.95)	-4.971*** (-6.95)	-44.799 (-0.66)
QUAL _{1jt-1}	?	0.830*** (17.11)		
SCOPE _{1jt-1}	?		0.799*** (17.82)	
QUAN _{1jt-1}	?			0.906*** (23.95)
Industry fixed effects		yes	yes	yes
R ²		69.7%	65.7%	78.4%
Adj. R ²		68.4%	64.2%	77.5%

Notes. This table shows the OLS analysis for forward-looking disclosure and its determinants by additionally including lagged disclosure variables in the model.

For the multivariate analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity-robust and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: QUAL_{jt} = firm j's year t absolute forward-looking disclosure quality index; SCOPE_{jt} = firm j's year t absolute forward-looking disclosure scope index; QUAN_{jt} = firm j's year t absolute forward-looking disclosure quantity measure; SIZE_{jt} = the log of firm j's total assets at the end of fiscal year t; CHS_{jt} = firm j's percentage of equity owned by the insiders to all equity of the firm at the end of fiscal year t; LEV_{jt} = firm j's total debt divided by the total assets at the end of fiscal year t; ROE_{jt} = firm j's return on equity (net income before preferred dividends - preferred dividend requirement) / average of last year's and current year's common

⁵⁰ For the quality and scope models the association between disclosure and crisis is expected to be negative. For the relation between quantity and crisis the direction is unclear.

equity * 100) at the end of fiscal year t ; $VOLA_{jt}$ = variance of total shareholder return over the last five years of firm j for fiscal year t ; AUD_{jt} = an indicator variable equal to 1 if firm j is audited by a Big4 company for fiscal year t , and 0 otherwise; $CRISIS_t$ = is an indicator variable, equal to 1 if the fiscal year t is considered to be crisis year (2008), 0 otherwise (2005-2007 and 2009); $QUAL_{l_{jt-1}}$ = firm j 's year $t-1$ absolute forward-looking disclosure quality index; $SCOPE_{l_{jt-1}}$ = firm j 's year $t-1$ absolute forward-looking disclosure scope index; $QUAN_{l_{jt-1}}$ = firm j 's year $t-1$ absolute forward-looking disclosure quantity measure.

Table 16: Regression with Lagged Variables

3.6 Summary

The first aim of this chapter was to examine the forward-looking reporting quality, scope and quantity of German listed companies in uncertain environment arising from the global financial crisis and normal periods. Using a sample of German listed firms over a period of five years, from 2005 to 2009, I find that forward-looking disclosure quality and scope decreased significantly in times of crisis. The quantity measure confirms that companies still report during crisis by showing an increasing volume of the reported number of words.

The second objective was to shed light on other influencing control factors affecting companies' forward-looking reporting quality, scope and quantity. In the pooled-regression model the quality and scope is found to be significantly related to firm size, crisis and performance. The performance as a measure for uncertainty shows that the forward-looking disclosure quality, scope respectively is lower in times of a more volatile performance. For the quantity measure the independent variables firm size, closely held shares and return on equity are significant.

The study does not only contribute to prior literature but the results are also of practical relevance for the standard setting body in Germany (GASB), which published a draft, D-GAS 27 for "Group Management Reporting" in December 2011, and for the companies. On the one hand the analysis of the quality of forward-looking reports can serve as a recommendation for companies to improve, rethink and revise their reporting. On the other hand, the results provide useful insights for the GASB for the revision of the management reporting standard and in particular for the forward-looking reporting section. In particular the study shows the great variety among firms and that clearer regulations would

be helpful for the firms in order to provide transparent, informative and high-quality forward-looking statements. For example, a minimum requirement for important ratios (i.a. earnings, revenues) could be mandated.

One limitation of my study is that there might be other factors influencing the disclosure of forward-looking reporting that could not be incorporated in the model due to lack of data. Factors could be management's personal reporting decisions or the company's stated disclosure policy. However, these factors could not be observed externally. Another limitation is the definition of quality and scope. The indices were constructed as objective as possible, nevertheless there could be other opinions which items should be included in the indices. Consequently, only persons complying with the form of my index construction might find it useful for the intended purpose.

Future researchers could investigate the background of companies' forward-looking reporting behavior. Up till now, not much is known about the processes and decisions in the companies regarding dissemination of forecasts. Thus, via a survey and interview based study managerial incentives for withholding and dissemination of future information, could be analyzed. Knauer and Wömpener (2011) already analyze nine firms to examine their reporting behavior decisions. But an in-depth, large-scale analysis is still missing. Further, since my study is limited to forward-looking reporting in annual reports of large German firms, subsequent studies could examine interim forward-looking reporting and include mid-size listed and non-listed firms.

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4 Does Forward-Looking Disclosure Affect Information Asymmetry?

4.1 Introduction

In this chapter, I examine the relationship between forward-looking reporting disclosure quality and information asymmetry as measured by bid-ask spreads. Information asymmetries can arise due to different levels of information distributions between principals and agents. But increased levels of disclosure tend to reduce information asymmetries. By using the specific German setting of a mandatory forward-looking report with voluntary contents, I find that bid-ask spreads can vary with the disclosure quality of the forward-looking reports.

Forward-looking reporting has been of particular interest for regulators since the financial crisis, when the reporting standards of German firms underwent a change. These circumstances induced the revision of the current German Accounting Standard GAS 15 “Management Reporting” by the German Accounting Standards Board (GASB). They published a new draft, D-GAS 27, in December 2011. Forecasts are an important instrument for investor decision-making especially in times of uncertainty, because a lack of disclosures or imprecise disclosures can cause distrust and attract the attention of regulators (Knauer and Wömpener 2011; Ruhwedel et al. 2009).

The motivation of this chapter is to extend and complement the classic voluntary disclosure studies of corporate reporting. Prior research has mainly considered overall corporate company disclosures, not just one particular class. I focus on German forward-looking reports, and provide information about various types of forecasts and prospect information within the forward-looking report. Compared to management forecasts, my focus goes beyond earnings forecasts, such as those issued in press releases. The richness and scope of the information contained in forward-looking reports is more extensive and more detailed, because it concentrates on many different facets of the firm’s possible future.

The relationship between information asymmetry and disclosure has been explored in earlier research. Agency theory suggests a negative association between the two variables. However, empirical research has found mixed results. For example, Leuz and Verrecchia (2000), Brown and Hillegeist (2007), and Welker (1995) identify a significant negative relationship, but Chang et al. (2008) find no relationship. Richardson and Welker (2001), in contrast, find a positive relationship between social disclosure and the cost of equity. Other studies, such as Botosan (1997), Richardson and Welker (2001), and Dhaliwal et al. (2011), find that the negative relationship is only valid under certain circumstances.

I first use the bid-ask spread as a proxy for information asymmetry to examine the relationship between forward-looking disclosure quality and information asymmetry. I hypothesize that the quality of the forward-looking report will affect the information asymmetry. This is because firm-specific forecasts, especially if audited, are important tools for investors' forecasting efforts. I measure annual absolute disclosure quality via a self-constructed index that is based on a predefined list of items derived from the literature, auditing checklists, the German Commercial Code, and German Accounting Standard (GAS) 15, with a focus on company-specific disclosure. In addition to measuring the presence or absence of forward-looking information, I can analyze the forecast precision and direction of the disclosed information more extensively for different forecast horizons.

I regress the bid-ask spread on forward-looking disclosure quality and on different control variables for information asymmetry. In addition to the common bid-ask spread controls, I control for other information (*OI*) obtained from annual reports besides the forward-looking report. The *OI* variable is based on the index used to assess firm disclosure quality in the context of the *Best Annual Report*

contest, which is conducted annually by the publication *Manager Magazin* in conjunction with a team of the University of Münster.⁵¹

Second, I examine the relation between a change in the quality of the forward-looking reporting and bid-ask spreads. I consider firms with improved and declining reporting quality, and compare them with companies that exhibit a stable quality level.

Third, I use two periods, period 1 (2005-2007), which represents years of growth and stability, and period 2 (2008-2009), which represents years of crisis and insecurity. I compare firms' bid-ask spreads for period 1 and period 2. I only use firms that increase or decrease their reporting quality. And I again use different definitions for quality changes.

My sample consists of companies listed on the German stock market (HDAX and SDAX). Because new regulations concerning forward-looking reporting were released in 2004/2005, I analyze company annual reports for the 2005-2009 time period. I show a significant negative relationship between forward-looking disclosure quality and the bid-ask spread, which suggests that a higher level of forward-looking reporting leads to lower information asymmetry. When including the *OI* variable, the relationship between *OI* and the bid-ask spread is significant. But the relationship between *QUAL* and the bid-ask spread is no longer significant, which indicates that most information has already been captured by *OI*. The results are stable for a variation in the quality variable, as well as for modifications to the dependent and control variables.

For firms with improved levels of forward-looking reporting, I find that an increase leads to significantly lower bid-ask spreads. For firms with declining levels of forward-looking reporting, I find no correlation with bid-ask spreads.

⁵¹ See e.g. (Baetge et al. 2010).

Comparing the bid ask-spread both before and after a quality change, I find a significantly negative relationship for firms with increasing and decreasing quality levels. The first result is in line with prior research and the theoretical background. However, the latter does not comply with prior theory.

My study contributes to prior literature in different ways. First, I use forward-looking reporting and examine its effect on the bid-ask spread. Prior research does not specifically focus on forward-looking reporting. Second, my study goes beyond prior research focusing on one class of forecasts. Instead, the overall forward-looking reporting is taken into consideration. Third, I use the unique setting of audited German forward-looking reports, between mandatory and voluntary reporting.

This chapter is organized as follows. Section 4.2 provides a description of the institutional setting in Germany while section 4.3 gives a literature review of prior research. Section 4.4 discusses my hypotheses. In section 4.5, the study sample and the research method are presented, while section 4.6 gives my empirical results. Finally, section 4.7 summarizes my findings, and provides conclusions about my major findings.

4.2 Institutional background

As illustrated, in section 2.3.1 the German forward-looking reporting is a mixture between mandatory and voluntary reporting. Forward-looking information has been a mandatory component of the management report since 2005 (Krawitz and Hartmann 2006). The precise contents of management reporting are regulated by the GCC's sections 289 and section 315 for groups of companies. For future-oriented information, the GCC s. 315 [1] states that a company must assess and discuss the expected development of the group, as well as the underlying assumptions about its significant risks and opportunities. Companies reporting under IFRS are also required to prepare management reports in accordance with the GCC.

Forward-looking reports provide information about all kinds of forecasts and company prospects. Compared to management forecasts, however, the focus is not only on earnings, such as those issued in press releases. The richness and scope go far beyond that, as the information is much more holistic, and thus concentrates on many different facets of the firm's possible future.

In addition to the minimum disclosure requirements mentioned in the GCC, further information about forward-looking reports was not required by law. However, the German Accounting Standards Board (GASB) amended this regulation and issued recommendations and a framework for presenting management and forward-looking reports in German Accounting Standard (GAS) No. 15, "Management Reporting". However, GAS 15, as with all GAS, is only a recommendation, and is not legally binding. For a detailed overview of the institutional background, see section 2.3.1

4.3 Literature Overview

I classify prior research into two groups: 1) studies that analyze the nature of overall corporate disclosures, and 2) studies that focus on a particular class of reporting (e.g., corporate social responsibility (CSR) reporting, web disclosures, earnings forecasts).

Brown and Hillegeist (2007) examine the relationship between firm disclosure quality and information asymmetry. For the overall disclosure index, they find a significantly negative relationship between the two variables. Considering the subindices separately, the quarterly index shows a significantly positive relationship, while for the annual and investor relation categories, they find a significant negative relationship.

Jiang et al. (2011) analyze the relationship between ownership concentration and information asymmetry conditional on voluntary disclosure for New Zealand companies. They calculate disclosure quality by means of a self-constructed

index. The results show that a better disclosure of firms with more concentrated ownership results in a lower bid-ask spread.

Healy et al. (1999) examine companies with improved reporting quality, as measured by the AIMR ranking. They find that these firms can significantly reduce the information asymmetry measured by the bid-ask spread. Prior to the reporting quality change, their bid-ask spreads were higher than those of industry peers. Afterward, their disclosure quality tended to be more comparable to that of industry peers.

Botosan (1997) examines the relationship between a self-constructed disclosure score and the cost of equity capital. She finds that a higher disclosure level leads to lower costs of equity for firms with low analyst followings.

Petersen and Plenborg (2006) study the relationship between different information asymmetry proxies and the voluntary disclosure level of Danish listed companies. They find that higher disclosure leads to a lower bid-ask spread and higher turnover. They split the overall disclosure index into five subgroups, and find that only the marketing category has a significant impact on information asymmetry. This indicates that the combination of information is what is ultimately useful for investors.

The focus of Welker's (1995) study is the relationship between baseline spreads as a proxy for information asymmetry and the general level of disclosure. He finds a negative relationship between bid-ask spread and disclosure. Classifying the firms according to their level of disclosure quality, the relative bid-ask spread is 50% higher for firms ranked in the bottom third.

Dhaliwal et al. (2011) analyze whether the disclosure of CSR information leads to a reduction in a firm's cost of equity capital. They focus exclusively on the stand-alone characteristic of CSR information, and show that high-performing firms that disclose CSR information tend to have a lower cost of equity capital.

Muiño and Trombetta (2009) study financial graph disclosure. They observe a significantly negative relationship between the disclosure of favorable graph distortions and the cost of equity capital. However, they do not find any relationship for unfavorable distortions.

Coller and Yohn (1997) examine the specific case of earnings forecasts, and analyze whether firms issuing earnings forecasts face lower costs of equity capital. They observe that firms providing management earnings forecasts face significantly higher bid-ask spreads prior to the forecast, compared to non-forecasting firms. After the forecast release, they find no differences in bid-ask spreads between forecasters and non-forecasters.

Other prior research has also specifically considered firms issuing earnings forecasts. However, most study the event of an announcement, but not the characteristics of the forecast. Most of these studies also analyze the bid-ask spread before and/or after announcements. They observe how the spread develops and study the influencing factors. Many find high spreads around the announcement date. Lee et al. (1993) find an increase in information asymmetry directly after the earnings announcement; Libby et al.(2002) find higher spreads beforehand, and lower spreads afterward.

The finding of a higher spread after earnings announcements is in line with Kim and Verrecchia (1994, 1991), who find that some investors are likely to misinterpret the announcement. Thus, some investors will also not be able to correctly interpret the information leading to higher spreads (Kim and Verrecchia 1994, 1991). However, because disclosure is not incorporated as a variable itself in these models, these studies would not be considered more detailed, as my purpose is different.

Prior German research has focused primarily on overall disclosure. For example, Häußler (2008) uses *Best Annual Report* data to illustrate the relationships between interim and annual reporting and information asymmetry

and the cost of capital. The results are weak, however, and differ according to the measurement used. A significantly negative relationship is found only for the relationship between annual report disclosures and the bid-ask spread as a proxy for information asymmetry.

Gierga (2008) uses a self-constructed index to address the same research question, showing significantly negative relationships between the bid-ask spread as a proxy for information asymmetry and disclosure. Grüning (2011a) comes to the same conclusion, finding a negative relationship between a self-constructed corporate disclosure index and the bid-ask spread.

This study contributes to prior literature in several ways. The relationship between forward-looking reporting and the information asymmetry component of the cost of equity capital has not been widely examined until now. Some earlier studies incorporated forward-looking elements into their overall disclosure scores, but not to any great extent. And much prior research has focused on only one class of forecasts.

My study extends prior research by analyzing all types of forward-looking information provided by firms in their reports. I believe that using this particular piece of the management report as an explanatory variable for information asymmetry should be of particular interest to investors, because “information about [...] future prospects is generally perceived as important by investors” (Petersen and Plenborg 2006, 132) in order to assess future firm developments. In addition, the “hybrid” characteristic of the German forward-looking report, as something of a cross between voluntary and mandatory reporting, provides a unique and interesting research setting. Furthermore, forward-looking reports are audited implying that the content is not completely voluntary.

4.4 Hypothesis Development

Information asymmetry is the basic problem described in principal-agent theory. It occurs when different user groups have access to different levels of information.

Assuming that both parties are maximizing their own benefits, conflicts of interest between agents and principals are likely to arise due to information asymmetries (Jensen and Meckling 1976). Furthermore, the problem of adverse selection, which makes distinguishing between informed and uninformed market participants difficult, can also arise due to differing levels of information (Chang et al. 2008; Verrecchia 2001).

However, information asymmetry can be reduced by financial reporting in general (Watts 1977), and voluntary disclosure in particular (Eng and Mak 2003; Hossain et al. 1995). Previously uninformed investors who gain access to more information are likely to trade more stocks. Furthermore, an increase in disclosure is associated with relatively less informed trading, which again reduces information asymmetry (Brown and Hillegeist 2007; Lee et al. 1993). Reduced information asymmetry can in turn lead to higher interest in a firm's shares, thus leading to lower costs of capital and higher market liquidity (Amihud and Mendelson 1986; Diamond and Verrecchia 1991). Overall, increased disclosure leads to a reduction in private information searches (Diamond 1985), and greater transparency and visibility for firms (Verrecchia 2001).

Prior research has found that the relationship between disclosure quality⁵² and information asymmetry was likely to be negative (Cheng et al. 2006; Leuz and Verrecchia 2000; Welker 1995). Thus, I propose the following hypothesis for the information asymmetry component of the cost of equity capital, as measured by the bid-ask spread:

H4: The bid-ask spread is lower for firms with higher levels of forward-looking disclosure quality.

⁵² I use disclosure here in the sense of either a corporate overall disclosure score, or a disclosure score of a particular report/field of interest.

An expansion of disclosure leads to reductions in the bid-ask spread by reducing the information asymmetry between management and investors. Healy et al. (1999) compare firms with improved disclosure levels with firms whose disclosure levels have stayed constant. They find lower bid-ask spreads for firms with improved disclosure quality.

I also compare companies with changing forward-looking disclosure quality with companies whose level of quality has stayed constant. Variations in disclosure quality are expected to have an influence on the bid-ask spread. In my setting, I consider variations from both “higher” to “lower” disclosure levels, and vice versa. My second set of hypotheses are thus:

H5a: The bid-ask spread is lower for firms whose disclosure levels have changed from lower to higher compared to firms not experiencing such a change.

H5b: The bid-ask spread is higher for firms whose disclosure levels have changed from higher to lower compared to firms not experiencing such a change.

Improving (decreasing) the level of disclosure quality should lead to a lower (higher) bid-ask spread after the change occurs. I focus exclusively on firms who experience a change in the level of forward-looking reporting quality, and compare their bid-ask spreads before and after the change. Thus, I hypothesize further that:

H6a: Firms that experience a change from lower to higher forward-looking reporting quality will exhibit lower bid-ask spreads after the change.

H6b: Firms that experience a change from higher to lower forward-looking reporting quality will exhibit higher bid-ask spreads after the change.

4.5 Research Design and Sample

4.5.1 Model Specification

I test whether forward-looking disclosure quality influences information asymmetry (H4), using the regression in Equation (2):

$$\begin{aligned} \log BAS_{jt} = & \beta_0 + \beta_1 \log MV_{jt} + \beta_2 \log PRICE_{jt} + \beta_3 \log TURN_{jt} + \beta_4 \log RET_{jt} + \beta_5 \log FF_{jt} \\ & + \sum_{k=1}^8 \alpha_k \beta_6 IND_j + \sum_{m=1}^5 \alpha_m \beta_7 YD_t + \beta_8 \log QUAL_{jt} + \beta_9 OI_{jt} + \varepsilon_{jt} \end{aligned} \quad (2)$$

where:

$\log BAS_{jt}$ is the log of firm j's year t bid-ask spread, measured as the firm's average daily bid-ask spread over the fourth month following year-end. I calculate the daily bid-ask spread as the ask price minus the bid price, divided by their average;

$\log MV_{jt}$ is the log of firm j's year t market value at the end of the fourth month following year-end;

$\log PRICE_{jt}$ is the log of firm j's year t stock price at the end of the fourth month following year-end;

$\log TURN_{jt}$ is the log of firm j's year t daily turnover, averaged over the fourth month following year-end;

$\log RET_{jt}$ is the log of firm j's year t standard deviation of stock returns over the fourth month following year-end;

$\log FF_{jt}$ is the log of firm j's year t free float at the end of the fourth month following year-end;

IND_j is a vector of industry dummy variables equal to 1 if firm j is operating in one of the following industries: utilities, telecommunications, industrials, information technology, pharma & healthcare, basic materials, consumer goods and consumer services, and 0 otherwise;

- YD_t is a vector of year dummy variables;
- $\log QUAL_{jt}$ is the log of firms j 's year t absolute forward-looking disclosure quality index; and
- OI_{jt} is firm j 's year t relative disclosure quality index of the annual report apart from the forward-looking report.

Datastream from Thompson Reuters serves as a data source for the control variables and the dependent variable. The variables $\log QUAL$ and YD are hand-collected. The control variable IND is categorized according to the classification scheme of Deutsche Börse. The variable OI is obtained from the University of Münster.

The dependent variable is the bid-ask spread, which is commonly considered a measure of information asymmetry. Following prior literature, I include several control variables for the determinants of bid-ask spreads (Leuz and Verrecchia 2000; Stoll 1978, 2000). The dependent and control variables are log-linearly transformed in order to address the problem of multiplicative relationships between determinants (Stoll 1978). I also log-transform the $QUAL$ variable in order to prevent skewness.

I incorporate $\log MV$ to control for the information environment; its predicted sign is negative. I include $\log PRICE$ to control for the effect of discreteness; its predicted sign is also negative. Next, I include $\log TURN$ to capture a firm's trading activity; the expected sign again is negative. To capture the risk of an adverse price change, I include $\log RET$; its expected sign is positive. $\log FF$ is included because I expect that, with a higher percentage of shares not held by insiders, the bid-ask spread will be lower, thus predicting a negative relationship.

I consider IND as another control variable of interest, as industry affiliation may impact a firm's information asymmetry (Cheng et al. 2006; Daske 2006). Lastly, I control for time by incorporating year dummies.

LogQUAL is the primary experimental variable. A higher level of forward-looking disclosure quality is expected to lead to reduced information asymmetry, implying a lower bid-ask spread.⁵³

But because the forward-looking report is not released independently, the rest of the information in the annual report must also be considered. Therefore, I also include the variable *OI* to control for the other information released in the annual report.

As suggested in prior research, I use the fourth month following the fiscal year-end as a starting point, as well as a one-month window to measure the dependent and control variables. The fourth month is commonly used to ensure that all companies have had time to release their annual reports (Muller et al. 2011).

To explore the sensitivity of the results, I also use a different window length and a different starting point. The different starting point begins one day after the release of the annual report, in order to capture companies' exact release dates. The different window length is a three-month horizon instead of one month, in order to capture a longer time frame and determine whether it affects the results.

Additionally, I use the advanced bid-ask spread model, I compare companies with a change in disclosure level with companies that have a constant disclosure level. I use two different models to test whether a change from lower (higher) to higher (lower) quality influences information asymmetry by decreasing (increasing) it (H5a and H5b). I use the following regressions to test the hypotheses:

$$\begin{aligned} \log BAS_{jt} = & \beta_0 + \beta_1 \log MV_{jt} + \beta_2 \log PRICE_{jt} + \beta_3 \log TURN_{jt} + \beta_4 \log RET_{jt} + \beta_5 \log FF_{jt} \\ & + \sum_{k=1}^8 \alpha_k \beta_6 IND_j + \beta_7 QUAL_G_{jt} + \varepsilon_{jt} \end{aligned} \quad (3)$$

⁵³ The calculation of the variable is described in more detail in section 4.5.2.

$$\log BAS_{jt} = \beta_0 + \beta_1 \log MV_{jt} + \beta_2 \log PRICE_{jt} + \beta_3 \log TURN_{jt} + \beta_4 \log RET_{jt} + \beta_5 \log FF_{jt} + \sum_{k=1}^8 \alpha_k \beta_6 IND_j + \beta_7 QUAL_B_{jt} + \varepsilon_{jt} \quad (4)$$

where:

$QUAL_G_{jt}$ is an indicator variable equal to 1 if firm j undergoes a change in forward-looking disclosure quality from a lower level in year t - 1 to a higher level in year t, and 0 if the quality level remains stable, and

$QUAL_B_{jt}$ is an indicator variable equal to 1 if firm j changes forward-looking disclosure quality from a higher level in year t - 1 to a lower level in year t, and 0 if the quality level remains stable.

All other variables from Equations (3) and (4) are defined as in section before.

Note that it can be difficult to precisely define a change in forward-looking disclosure quality. For example, what level of increase (decrease) is considered to be an improvement (decline)? But, for my purposes, a measure needs to be defined that will adequately illustrate a change from higher (lower) to lower (higher) disclosure quality levels. Therefore, I use the different dimensions of a change in the level of quality. In order to capture a larger increase (decrease) from one year to the next, I use a percentage change (+/-30%, +/- 50%, and +/- 70%),⁵⁴ a decile change (+/- 2, 3, and 4 deciles),⁵⁵ and a quintile change (+/- 1, 2, and 3 quintile(s)).⁵⁶

⁵⁴ In other words, this is a measure of whether the company had an increase (decrease) in reporting quality of more than 30%, 50%, or 70%, respectively.

⁵⁵ Companies are classified in deciles by their disclosure scores. From one year to the next, the change in deciles is then recorded.

⁵⁶ Companies are classified in quintiles by their disclosure scores. From one year to the next, the change in quintiles is then recorded.

Table 17 gives an overview of the number of companies that have experienced a disclosure change from one year to the next. The results show that more companies have had an increase, which is in line with the results from section 2.3.5.1. The increases are attributable to the unusually low disclosure quality levels in 2005 that occurred after the introduction of GAS 15. As firms adapt to the new regulation, the quality of their reporting tends to improve in the following years.

Increase in disclosure quality level			Decrease in disclosure quality level		
Percentage Change					
+30%	+50%	+70%	-30%	-50%	-70%
N = 132	N = 102	N = 71	N = 84	N = 39	N = 14
Deciles					
+2	+3	+4	-2	-3	-4
N = 80	N = 54	N = 22	N = 66	N = 43	N = 27
Quintiles					
+1	+2	+3	-1	-2	-3
N = 102	N = 34 ⁵⁷	N = 7	N = 83	N = 34	N = 6
<i>Notes.</i> This table shows the number of firms with a change in disclosure quality from one period to the next period. N is the number of firms with a change.					

Table 17: Companies with Change in Disclosure Quality Levels from One Year to the Next

Another classification method is to compare companies' bid-ask spreads before and after a change in reporting quality. Therefore, I divide the sample period into period 1 (2005-2007), which represents years of growth and stability, and period 2 (2008-2009), which represents years of crisis and insecurity. Period 1 will thus serve as the pre-period, and period 2 will be the post-period. I use the same classification of change variables as before, but now with a focus on comparing firms' changes from pre- to post-period. For my consideration of a change in

⁵⁷ Explanation for the differences in the number of observations occurring between increase/decrease of 2 quintiles and 4 deciles, see Appendix 5.

quality and the relationship with bid-ask spreads, I only consider companies with a change from period 1 (pre-period) to period 2 (post-period). I use the regression in Equation (5) to test the hypothesis:

$$\log BAS_{jt} = \beta_0 + \beta_1 \log MV_{jt} + \beta_2 \log PRICE_{jt} + \beta_3 \log TURN_{jt} + \beta_4 \log RET_{jt} + \beta_5 \log FF_{jt} + \sum_{k=1}^8 \alpha_k \beta_6 IND_j + POST_t + \beta_8 OI_{jt} + \varepsilon_{jt} \quad (5)$$

where

$POST_t$ is an indicator variable equal to 1 for the post-period (2008-2009), and 0 for the pre-period (2005-2007).

All the other variables are based on the definition given at the beginning of this section. The calculation for each variable of the different periods (pre-period: 2005-2007 and post-period 2008-2009) is carried out by computing the mean for each sub-period to obtain one value for each company for the respective period.

Table 18 illustrates the number of companies that have changed disclosure quality from period 1 to period 2 for each category. In most cases, more companies have decreased their disclosure levels. This result is not surprising, because there is somewhat of a constant quality increase from 2005 to 2007, followed by a strong decrease in 2008 (compare section 2.3.5.1). However, the sample size is very small, both for increasing and decreasing disclosure quality levels, and this can lead to problems in the empirical analysis.

Increase in disclosure quality level			Decrease in disclosure quality level		
Percentage Changes					
+30%	+50%	+70%	-30%	-50%	-70%
N = 22	N = 12	N = 8	N = 32	N = 12	N = 1
Deciles					
+2	+3	+4	-2	-3	-4
N = 8	N = 7	N = 4	N = 21	N = 9	N = 6
Quintiles					
+1	+2	+3	-1	-2	-3
N = 21	N = 5	N = 1	N = 28	N = 8	N = 4
<i>Notes.</i> This table shows the number of firms with a change in disclosure quality from pre-period to post-period. N is the number of firms with a change.					

Table 18: Companies with Change in Disclosure Quality Levels from Periods 1 to 2

4.5.2 Independent Variables Quality Index and Other Information

I use a disclosure score to proxy for forward-looking disclosure quality, and content analysis to transform text into a quantitative form (Krippendorff 2004; Weber 1990). The development of the disclosure score is based on a predefined checklist that includes various aspects and contents of forward-looking reporting, with an emphasis on company-specific forecasts. The list is based on prior international and German research on forward-looking disclosures, as well as on auditing checklists, regulations and regulation annotations.

I follow Botosan's (1997) approach, and weight quantitative information more heavily "because precise information is more useful and may enhance management's reporting reputation and credibility" (p. 334). I group the checklist into three categories: company environment, company-specific forecasts, and other disclosure items.

The quality index (*QUAL*) consists of the following three categories.⁵⁸

- The first category consists of expected prospects for the economy and the industry. I analyze dichotomously whether the company included such a forecast, with a score equal to 1 if a forecast was included, and 0 otherwise.
- The second category considers qualitative and quantitative company-specific forecasts such as, e.g., strategy, revenue, or earnings forecasts.
 - I distinguish between items coded dichotomously (e.g., did the company change its operating policies?)
 - and items such as ratios (e.g., earnings forecasts), which are coded along three different dimensions, as follows:
 - Forecast horizon (undisclosed, one-year, two-year, intermediate-term, long-term).⁵⁹
 - Ex ante forecast precision (undisclosed, qualitative, comparative, minimum/maximum, vague range, bound range, point).
 - Economic direction (undisclosed, positive, negative, equal) of future development.
- The third category encompasses other items (again dichotomously), such as whether an overall conclusion is given, or whether major assumptions are reported.

I obtain the *OI* variable from the *Best Annual Report* competition, which is conducted annually by a team from the University of Münster in conjunction with *Manager Magazin*. The report provides a disclosure score for annual reports based on content (60%), linguistics (20%), and creativity (20%). The content section alone considers more than 330 relevant items. The overall assessment of this

⁵⁸ For more details concerning the quality index construction, see section 2.3.3.1.1

⁵⁹ Intermediate-term refers to a three- to five-year forecast horizon; long-term refers to a six- to ten-year forecast horizon.

section consists of the annual report itself (80%), and the interim Q3 report (20%).⁶⁰ One section of the analysis is the forward-looking report, analyzed using approximately eighteen items.⁶¹ For the purpose of my study, I use the overall annual report disclosure score, from which I subtract the score of the forward-looking section. Thus, I ensure control of the information provided in the annual report apart from the forward-looking report. The correlation between the forward-looking score of the *Best Annual Report* and my disclosure quality score for the sample of this study is 0.50 (p-value: 0.01), for the Pearson correlation and 0.53 (p-value: 0.01), for the Spearman correlation.

4.5.3 Sample

The study is conducted for the years 2005 to 2009 based on the BilReG regulations, which have been applicable since 2005. The study population consists of the same sample described in section 2.3.2.

From the full sample of 579 analyzed annual reports (see also section 2.3.2), I further reduce the number due to data availability. I only include firms with data for the dependent, independent, and control variables. As illustrated in Table 19 for the other information and free float variables, I have missing values. Another reduction of one firm-year observation is based on the logarithmic calculation of a value of 0 (for the *QUAL* variable in 2008). Thus, the final sample is comprised of 458 observations.

	Companies	Firm years
Analyzed forward-looking reports	123	579
Availability of the <i>OI</i> and <i>logFF</i> variables	-10	-120
Logarithmic calculation	0	-1
Total Sample	113	458

Table 19: Sample

⁶⁰ The score of the *Best Annual Report* has been used in, e.g., (Baetge et al. 2010; Häußler 2008; Oberdörster 2009).

⁶¹ For more information about the *Best Annual Report*, see: <http://www.wiwi.uni-muenster.de/baetge/geschaeftsbericht/wettbewerb.html>

4.6 Empirical Results

4.6.1 Descriptive Statistics

Table 20 gives the descriptive statistics for my entire sample. The dependent variable *logBAS* varies between -8.156 and -2.786, with a mean of -5.598. The variability in firms' forward-looking reporting behavior is large for *logQUAL*, with values between 4.920 and 0.000 and a mean of quality of 3.100. The *OI* variable also shows a great variation in reporting quality of between 0.334 and 0.743, with a mean of 0.526.

Variable	N	Mean	Std. Dev.	Median	Minimum	Maximum
<i>logBAS</i> _{jt}	458	-5.598	1.131	-5.711	-8.156	-2.786
<i>logMV</i> _{jt}	458	7.339	1.575	7.128	3.940	11.275
<i>logPRICE</i> _{jt}	458	5.098	1.073	5.207	1.872	7.880
<i>logTURN</i> _{jt}	458	-5.764	1.083	-5.637	-10.597	-1.616
<i>logRET</i> _{jt}	458	1.881	1.148	1.911	-1.294	5.720
<i>logFF</i> _{jt}	458	-0.567	0.457	-0.453	-2.700	-0.001
<i>logQUAL</i> _{jt}	458	3.100	0.755	3.219	0.000	4.920
<i>OI</i> _{jt}	458	0.526	0.070	0.528	0.334	0.743

Notes. This table shows the descriptive statistics for all dependent, independent, and control variables.

I define the variables as follows: *logBAS*_{jt} = the log of firm *j*'s year *t* bid-ask spread, measured as the firm's average daily bid-ask spread over the fourth month following the year-end; *logMV*_{jt} = the log of firm *j*'s year *t* market value at the end of the fourth month following the year-end; *logPRICE*_{jt} = the log of firm *j*'s year *t* stock price at the end of the fourth month following the year-end; *logTURN*_{jt} = the log of firm *j*'s year *t* daily turnover, averaged over the fourth month following the year-end; *logRET*_{jt} = the log of firm *j*'s year *t* standard deviation of stock returns over the fourth month following the year-end; *logFF*_{jt} = the log of firm *j*'s year *t* free float at the end of the fourth month following the year-end; *logQUAL*_{jt} = the log of firms *j*'s year *t* absolute forward-looking disclosure quality index; and *OI*_{jt} = firm *j*'s year *t* relative disclosure quality index of the annual report apart from the forward-looking report.

Table 20: Descriptive Statistics

The correlation matrix in Table 21 shows that the dependent variable *logBAS* is significantly negatively correlated with all independent and most control variables for the Pearson and Spearman correlation. The correlation coefficients between *logBAS* and *logMV* and between *logRET* and *logPRICE* are in both cases very high, indicating possible multicollinearity. Correlations between independent

variables with values between 0.8 and 0.9 are considered harmful (Kennedy 2008). To address the multicollinearity assumption, I use the variance inflation factor (VIF); the results are provided in the next section (Wooldridge 2009). The high correlations are also in line with related work that shows similarly high correlations (Chang et al. 2008; Grüning 2011b).

	logBAS _{jt}	logMV _{jt}	logPRICE _{jt}	logTURN _{jt}	logRET _{jt}	logFF _{jt}	logQUAL _{jt}
PANEL A: Pearson Correlation							
logMV _{jt}	-0.819***						
logPRICE _{jt}	-0.252***	0.369***					
logTURN _{jt}	-0.580***	0.294***	-0.093**				
logRET _{jt}	-0.071	0.197***	0.835***	-0.049			
logFF _{jt}	-0.329***	0.061	-0.072	0.577***	-0.126***		
logQUAL _{jt}	-0.272***	0.241***	0.120**	0.120**	0.047	0.021	
OI _{jt}	-0.471***	0.480***	0.171***	0.198***	0.083*	0.093**	0.457***
PANEL B: Spearman Correlation							
logMV _{jt}	-0.821***						
logPRICE _{jt}	-0.267***	0.386***					
logTURN _{jt}	-0.609***	0.347***	-0.049				
logRET _{jt}	-0.074	0.205***	0.827***	-0.019			
logFF _{jt}	-0.348***	0.049	-0.026	0.590***	-0.061		
logQUAL _{jt}	-0.265***	0.252***	0.125***	0.145***	0.059	0.041	
OI _{jt}	-0.469***	0.485***	0.170***	0.233***	0.061	0.107**	0.465***

Notes. This table shows the Person correlations in Panel A and the Spearman correlations in Panel B among the dependent, independent, and control variables.

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: logBAS_{jt} = the log of firm j's year t bid-ask spread, measured as the firm's average daily bid-ask spread over the fourth months following the year-end; logMV_{jt} = the log of firm j's year t market value at the end of the fourth month following the year-end; logPRICE_{jt} = the log of firm j's year t stock price at the end of the fourth months following the year-end; logTURN_{jt} = the log of firm j's year t daily turnover, averaged over the fourth month following the year-end; logRET_{jt} = the log of firm j's year t standard deviation of stock returns over the fourth month following the year-end; logFF_{jt} = the log of firm j's year t free float at the end of the fourth month following the year-end; logQUAL_{jt} = the log of firms j's year t absolute forward-looking disclosure quality index; and OI_{jt} = firm j's year t relative disclosure quality index of the annual report apart from the forward-looking report.

Table 21: Correlation Matrix

4.6.2 Does the Quality of Firms' Forecasting Reports Affect Information Asymmetry?

Table 22 gives the results of the OLS regressions, which explore the effects of forward-looking disclosure quality on the bid-ask spread. I use a clustered

regression in order to adjust for firm-specific correlation (see also Li 2010). In model 1, I omit *logQUAL* and *OI* and only use the control variables of bid-ask spreads. All the control variables are significant and show the expected signs.

In model 2, I only use *logQUAL* for disclosure, while in model 3, I also incorporate *OI*. The R^2 s of both models are quite high, at 85.3% and 85.5%, respectively. I test for possible non-linear relationships among the independent variables by using the Variance Inflation Factor (VIF). It does not exceed 10 in any case, indicating no multicollinearity (Wooldridge 2009)

As model 2 shows, there is a significantly negative relationship between forward-looking disclosure quality and the bid-ask spread, with a coefficient (t-statistic) of -0.063 (-2.11). All other control variables are significant, and show the expected signs: *logMV* (coefficient = -0.496, t-statistic = -29.14), *logPRICE* (coefficient = -0.216, t-statistic = -4.58), *logTURN* (coefficient = -0.360; t-statistic = -9.80), *logRET* (coefficient = 0.190, t-statistic = 4.81), *logFF* (coefficient = -0.140, t-statistic = -2.11). Thus, my results are in line with prior research and provide evidence that a higher level of forward-looking reporting quality leads to lower information asymmetry as measured by the bid-ask spread.

Model 3 reveals the results of including the independent variable *OI*, controlling for all other information released in the annual report. The significance level and the sign of the control variables remain the same as in model 1. However, the relationship between *logQUAL* and the bid-ask spread is not significant (coefficient = -0.029, t-statistic = -0.95). The *OI* variable is significantly negatively related to the bid-ask spread with a coefficient (t-statistic) of -0.985 (-2.64). This suggests that firms with high overall reporting quality (excluding forward-looking reporting quality) have significantly lower bid-ask spreads. It also indicates that some information is captured by *OI*, leading to non-significant results for *QUAL*.

$$\log\text{BAS}_{jt} = \beta_0 + \beta_1 \log\text{MV}_{jt} + \beta_2 \log\text{PRICE}_{jt} + \beta_3 \log\text{TURN}_{jt} + \beta_4 \log\text{RET}_{jt} + \beta_5 \log\text{FF}_{jt} + \sum_{k=1}^8 \alpha_k \beta_6 \text{IND}_j + \sum_{m=1}^5 \alpha_m + \beta_7 \text{YD}_t + \beta_8 \log\text{QUAL}_{jt} + \beta_9 \text{OI}_{jt} + \varepsilon_{jt}$$

	Exp. Sign	Model 1 (N= 458)	VIF	Model 2 (N= 458)	VIF	Model 3 (N= 458)	VIF
Intercept	?	-3.180*** (-9.41)		-2.992*** (-8.56)		-2.713*** (-7.32)	
logMV _{jt}	-	-0.502*** (-29.34)	1.55	-0.496*** (-29.14)	1.61	-0.478*** (-26.75)	1.96
logPRICE _{jt}	-	-0.217*** (-4.61)	5.69	-0.216*** (-4.58)	5.71	-0.215*** (-4.59)	5.83
logTURN _{jt}	-	-0.364*** (-9.78)	1.81	-0.360*** (-9.80)	1.82	-0.360*** (-10.05)	2.06
logRET _{jt}	+	0.191*** (4.85)	4.77	0.190*** (4.81)	4.78	0.189*** (4.86)	4.79
logFF _{jt}	-	-0.133** (-1.97)	1.49	-0.140** (-2.11)	1.49	-0.134** (-2.06)	1.70
logQUAL _{jt}	-			-0.063** (-2.11)	1.19	-0.029 (-0.95)	1.43
OI _{jt}	-					-0.985*** (-2.64)	1.78
Industry fixed effects		yes		yes		yes	
Year fixed effects		yes		yes		yes	
R ²		85.1%		85.3%		85.5%	
Adj. R ²		84.6%		84.7%		84.9%	

Notes. This table shows the OLS analysis for bid-ask spreads and forward-looking disclosure quality.

For the multivariate analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity-robust and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: logMV_{jt} = the log of firm j's year t market value at the end of the fourth month following the year-end; logPRICE_{jt} = the log of firm j's year t stock price at the end of the fourth month following the year-end; logTURN_{jt} = the log of firm j's year t daily turnover, averaged over the fourth months following the year-end; logRET_{jt} = the log of firm j's year t standard deviation of stock returns over the fourth months following the year-end; logFF_{jt} = the log of firm j's year t free float at the end of the fourth months following the year-end; logQUAL_{jt} = the log of firms j's year t absolute forward-looking disclosure quality index; and OI_{jt} = firm j's year t relative disclosure quality index of the annual report apart from the forward-looking report.

Table 22: The Relationship Between Bid-Ask Spreads and Forward-Looking Disclosure Quality

4.6.2.1 Exclusion of Outliers

I exclude five severe outliers in order to validate my results. As illustrated in Table 23, this exclusion does not affect the results of model 1 (with quality) or of model 2 (with quality and other information). I again find a statistically significant relationship between *logQUAL* and the bid-ask spread in model 1 (coefficient = -0.063, t-statistic = -2.01), and between *OI* (coefficient = -0.996, t-statistic = -2.64) and the bid-ask spread in model 2. All other control variables are also significant and have the expected signs, indicating that the results are not driven by outliers.

4.6.2.2 Different Independent Disclosure Variables

As a second test for the robustness of my results, I use a scope index, which uses a different weighting than the quality index. It is comprised of the same items, but, in contrast, it distinguishes between information that is present or absent only by assigning dichotomous variables. Previously, section 2.3.3.1 described weights for ex ante precision and the economic direction that were not relevant for the scope index. However, here, when compared to the quality index, it is only important whether the item was reported in the forward-looking report. The unweighted quality index is a proxy for the reported scope, because it only measures the number of disclosed items.

The results in Table 24 show that scope also has a significant impact on the bid-ask spread for model 1 (coefficient = -0.006, t-statistic = -2.33). In model 2, the results remain stable. The *OI* variable is again significant (coefficient = -0.938, t-statistic = -2.48), as are all other control variables in both models, and they all show the expected signs. Consequently, the results are robust to modifications in the disclosure index in terms of weighting.

	Model 1 (N = 453)	Model 2 (N = 453)		Model 1 (N = 458)	Model 2 (N = 458)
Intercept	-2.997*** (-8.51)	-2.719*** (-7.31)	Intercept	-3.115*** (-9.43)	-2.784*** (-7.64)
logMV _{jt}	-0.496*** (-28.64)	-0.478*** (-26.45)	logMV _{jt}	-0.493*** (-28.61)	-0.477*** (-26.70)
logPRICE _{jt}	-0.216*** (-4.51)	-0.213*** (-4.48)	logPRICE _{jt}	-0.216*** (-4.59)	-0.215*** (-4.59)
logTURN _{jt}	-0.360*** (-9.78)	-0.360*** (-10.02)	logTURN _{jt}	-0.359*** (-9.77)	-0.359*** (-10.04)
logRET _{jt}	0.190*** (4.76)	0.188*** (4.78)	logRET _{jt}	0.192*** (4.88)	0.190*** (4.89)
logFF _{jt}	-0.140** (-2.11)	-0.135** (-2.07)	logFF _{jt}	-0.144** (-2.19)	-0.137** (-2.12)
logQUAL _{jt}	-0.063** (-2.01)	-0.028 (-0.86)	SCOPE _{jt}	-0.006** (-2.33)	-0.003 (-1.16)
OI _{jt}		-0.996*** (-2.64)	OI _{jt}		-0.938** (-2.48)
Industry fixed effects	yes	yes	Industry fixed effects	yes	yes
Year fixed effects	yes	yes	Year fixed effects	yes	yes
R ²	85.2%	85.4%	R ²	85.3%	85.5%
Adj. R ²	84.6%	84.8%	Adj. R ²	84.7%	84.9%

Notes. Table 23 and Table 24 show the OLS sensitivity analysis for bid-ask spreads and forward-looking disclosure quality. In Table 23, severe outliers are excluded; in Table 24, I use a different measurement for the level of disclosure quality.

For the multivariate analysis, the coefficients are given with t-statistics in parentheses. The standard errors are heteroskedasticity-robust, and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: logBAS_{jt} = the log of firm j's year t bid-ask spread, measured as the firm's average daily bid-ask spread over the fourth months following the year-end; logMV_{jt} = the log of firm j's year t market value at the end of the fourth month following the year-end; logPRICE_{jt} = the log of firm j's year t stock price at the end of the fourth months following the year-end; logTURN_{jt} = the log of firm j's year t daily turnover, averaged over the fourth month following the year-end; logRET_{jt} = the log of firm j's year t standard deviation of stock returns over the fourth month following the year-end; logFF_{jt} = the log of firm j's year t free float at the end of the fourth month following the year-end; logQUAL_{jt} = the log of firms j's year t absolute forward-looking disclosure quality index; and OI_{jt} = firm j's year t relative disclosure quality index of the annual report apart from the forward-looking report; and SCOPE_{jt} = firm j's year t absolute forward-looking disclosure scope index.

Table 23: Sample Without Outlier

Table 24: Scope as a Measure of Disclosure

4.6.2.3 Different Measurement Period for Variables

I first calculate the bid-ask spreads and the other control variables over a different measurement window. Instead of using the fourth month following the fiscal year-end, I begin one day after the issuance date of the annual report.⁶² I then assess the variables over the months following the exact issuance date or at the end of the month following the issuance date of the annual report, respectively.

Table 25 shows the results for each company. Compared to the results in Table 22, I lose several observations because I was not able to obtain all issuance dates. I observe the same significant result for *logQUAL* as earlier (coefficient $t = -0.066$, t -statistic = -2.04). The results are also quite stable for model 2. But I find that the significance levels of *OI* and *logFF* decrease ($\rho < 0.1$). For model 1, the results indicate that a change in measurement period of the variables does not affect the results. For model 2, I find slight differences in the level of significance.

Second, I calculate a different window length. Instead of using a one-month period, I use a three-month period beginning four months after the fiscal year-end. The results are in Table 26. The relationship between bid-ask spreads and forward-looking disclosure quality remain the same. However, note that, in the long-term, the significance level in model 1 for *logQUAL* (coefficient = -0.077 , t -statistic = -2.70) increases ($\rho < 0.01$) compared to the basic model in Table 22.

In model 2, the significance level remains constant for the *OI* variable (coefficient = -1.041 , t -statistic = -2.80). The control variables remain largely the same. In model 1, the significance levels of *logPRICE*, *logRET*, and *logFF* decrease, while in model 2, those of *logRET* and *logFF* decrease. In summary, the results are mostly stable to modifications in window length, and they even improve for the independent variable *logQUAL* in model 1.

⁶² The issuance date of each annual report was obtained by hand-collecting the relevant dates from the firms' webpages or annual reports, if available, or by contacting the firms per email and telephone.

	Model (N = 403)	Model 2 (N = 403)		Model 1 (N = 458)	Model 2 (N = 458)
Intercept	-2.950*** (-8.06)	-2.736*** (-7.01)	Intercept	-3.534*** (-13.26)	-3.218*** (-11.18)
logMV _{it_i}	-0.501*** (-28.67)	-0.486*** (-25.84)	logMV _{it_w}	-0.485*** (-29.96)	-0.465*** (-26.59)
logPRICE _{jt_i}	-0.261*** (-4.91)	-0.264*** (-4.93)	logPRICE _{jt_w}	-0.121** (-2.50)	-0.126*** (-2.63)
logTURN _{it_i}	-0.376*** (-9.14)	-0.378*** (-9.31)	logTURN _{it_w}	-0.395*** (-14.11)	-0.395*** (-14.22)
logRET _{jt_i}	0.238*** (4.72)	0.240*** (4.75)	logRET _{jt_w}	0.099** (2.30)	0.104** (2.44)
logFF _{jt_i}	-0.130* (-1.80)	-0.121* (-1.70)	logFF _{jt_w}	-0.108* (-1.91)	-0.102* (-1.81)
logQUAL _{jt}	-0.066** (-2.04)	-0.040 (-1.19)	logQUAL _{jt}	-0.077*** (-2.70)	-0.041 (-1.33)
O _{jt}		-0.766* (-1.93)	O _{jt}		-1.041*** (-2.80)
Industry fixed effects	yes	yes	Industry fixed effects	yes	yes
Year fixed effects	yes	yes	Year fixed effects	yes	yes
R ²	85.4%	85.6%	R ²	85.6%	85.8%
Adj. R ²	84.8%	84.9%	Adj. R ²	85.0%	85.2%

Notes. Table 25 and Table 26 show the OLS sensitivity analysis for the bid-ask spreads and forward-looking disclosure quality. In Table 25, severe outliers are excluded; in Table 26, I use a different measurement for the level of disclosure quality.

For the multivariate analysis, the coefficients are given with t-statistics in parentheses. The standard errors are heteroskedasticity-robust, and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables in Table 25 as follows: logBAS_{jt_i} = the log of firm j's year t bid-ask spread, measured as the firm's average daily bid-ask spread over the months following the issuance date of the annual report; logMV_{jt_i} = the log of firm j's year t market value at the end of the month following the issuance date of the annual report; logPRICE_{jt_i} = the log of firm j's year t stock price at the end of the month following the issuance date of the annual report; logTURN_{jt_i} = the log of firm j's

I define the variables in Table 26 as follows: logBAS_{jt_w} = the log of firm j's year t bid-ask spread, measured as the firm's average daily bid-ask spread over the three months following the fourth month after year-end; logMV_{jt_w} = the log of firm j's year t market value at the end of the three months following the fourth month after year-end; logPRICE_{jt_w} = the log of firm j's year t stock price at the end of the third month following the fourth month after year-end; logTURN_{jt_w} = the log of firm j's

year t daily turnover, averaged over the month following the issuance date of the annual report; $\log\text{RET}_{j_t_i}$ = the log of firm j 's year t standard deviation of stock returns over the month following the issuance date of the annual report; $\log\text{FF}_{j_t_i}$ = the log of firm j 's year t free float at the end of the month following the issuance date of the annual report; $\log\text{QUAL}_{j_t}$ = the log of the absolute forward-looking disclosure quality index of firm j for year t ; and OI_{j_t} = the relative disclosure quality of the annual report of firm j for year t .

year t daily turnover, averaged over three months following the fourth month after year-end; $\log\text{RET}_{j_t_w}$ = the log of firm j 's year t standard deviation of stock returns over the three months following the fourth month after year-end; $\log\text{FF}_{j_t_w}$ = the log of firm j 's year t free float at the end of the third month following the fourth month after year-end; $\log\text{QUAL}_{j_t}$ = the log of the absolute forward-looking disclosure quality index of firm j for year t ; and OI_{j_t} = the relative disclosure quality of the annual report of firm j for year t .

Table 25: Different Starting Point

Table 26: Different Window Length

4.6.2.4 Different Disclosure Measure: Quantity

I additionally use a different measure for disclosure instead of the aforementioned quality (scope) indices. I use the quantity (*QUAN*) by measuring the total number of words of the forward-looking report of each company. The results in Table 27 show that by including *QUAN* in the basic model no statistical significant association between the length of the forward-looking reports and bid-ask spreads is observed (model 2). In model 3, while additionally controlling for *OI* a significant relationship with coefficient (p-value) of 0.000 (1.75) is obtained, indicating that a higher reporting volume implies a higher bid-ask spread.

$$\log\text{BAS}_{jt} = \beta_0 + \beta_1 \log\text{MV}_{jt} + \beta_2 \log\text{PRICE}_{jt} + \beta_3 \log\text{TURN}_{jt} + \beta_4 \log\text{RET}_{jt} + \beta_5 \log\text{FF}_{jt} + \sum_{k=1}^8 \alpha_k \beta_6 \text{IND}_j + \sum_{m=1}^5 \alpha_m + \beta_7 \text{YD}_t + \beta_8 \text{QUAN}_{jt} + \beta_9 \text{OI}_{jt} + \varepsilon_{jt}$$

	Exp. sign	Model 1 (N=458)	Model 2 (N=458)	Model 3 (N=458)
Intercept	?	-3.180*** (-9.41)	-3.186*** (-9.34)	-2.666*** (-7.14)
logMV _{jt}	-	-0.502*** (-29.34)	-0.504*** (-28.33)	-0.480*** (-26.57)
logPRICE _{jt}	-	-0.217*** (-4.61)	-0.217*** (-4.62)	-0.219*** (-4.75)
logTURN _{jt}	-	-0.364*** (-9.78)	-0.365*** (-9.68)	-0.365*** (-10.18)
logRET _{jt}	+	0.191*** (4.85)	0.192*** (4.87)	0.191*** (4.96)
logFF _{jt}	-	-0.133** (-1.97)	-0.134** (-1.97)	-0.135** (-2.05)
logQUAN _{jt}	?		0.000 (0.32)	0.000* (1.75)
OI _{jt}	-			-1.417*** (-3.77)
Industry fixed effects		yes	yes	yes
Year fixed effects		yes	yes	yes
R ²		0.851	0.851	0.856
Adj. R ²		0.846	0.845	0.85

Notes. This table shows the OLS analysis for bid-ask spreads and forward-looking disclosure quantity.

For the multivariate analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity-robust and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: logMV_{jt} = the log of firm j's year t market value at the end of the fourth month following the year-end; logPRICE_{jt} = the log of firm j's year t stock price at the end of the fourth month following the year-end; logTURN_{jt} = the log of firm j's year t daily turnover, averaged over the fourth months following the year-end; logRET_{jt} = the log of firm j's year t standard deviation of stock returns over the fourth months following the year-end; logFF_{jt} = the log of firm j's year t free float at the end of the fourth months following the year-end; QUAN_{jt} = firm j's year t absolute forward-looking disclosure quantity measure; and OI_{jt} = firm j's year t relative disclosure quality index of the annual report apart from the forward-looking report.

Table 27: The Relationship Between Bid-Ask Spreads and Forward-Looking Disclosure Quantity

4.6.3 Does Information Asymmetry Change When the Quality of Firms' Forecasting Reports Changes?

4.6.3.1 Switching versus Non-Switching Firms

To detect firms that have experienced a change in disclosure quality from one year to the next, I conduct two regressions, one for changes from lower to higher quality, and one for changes from higher to lower quality. I then compare them to firms with constant quality levels. I conduct the two regressions for different scenarios of quality changes (e.g., by percent, deciles, and quintiles). Table 28 summarizes the impact of an increase and a decrease in disclosure level on the bid-ask spread.

I generally find significantly lower bid-ask spreads for firms that increased disclosure quality from one period to the next, compared to those with unchanged reporting quality. Firms with a higher than 30% increase have lower bid-ask spreads (coefficient = -0.154, t-statistic = -2.29) as do firms with a higher than 50% increase (coefficient = -0.189, t-statistic = -2.67).

For an increase of two deciles (coefficient = -0.140, t-statistic = -2.17), three deciles (coefficient = -0.139, t-statistic = -1.85), one quintile (coefficient = -0.124, t-statistic = -2.03) and two quintiles (coefficient = -0.182, t-statistic = -2.05), I find the same relationship between the change variable and the bid-ask spreads. But a strong improvement (+70%, +4 deciles, +3 quintiles) does not impact the bid-ask spread. A stronger quality improvement is negatively correlated with the significance level, which indicates that improvements above a certain threshold do not provide any further influence on the bid-ask spread. However, the improvement is also related to the number of observations, which decrease for very strong quality increases (e.g., +4 deciles: N = 22, +3 quintiles: N = 7). This leads to a loss of statistical power.⁶³

⁶³ Appendix 6 gives detailed results of all the regression analyses for a quality increase.

For a decrease in disclosure level, I would expect that lower quality would lead to a higher bid-ask spread. However, none of the change proxies shows a relationship with the bid-ask spread, which indicates that a decrease in quality level does not impact the bid-ask spreads.⁶⁴

Increase in disclosure quality level			Decrease in disclosure quality level		
Percentage change					
+30%	+50%	+70%	-30%	-50%	-70%
sign. lower BAS (p < 0.05)	sign. lower BAS (p < 0.01)	no relationship	no relationship	no relationship	no relationship
(N = 132)	(N = 102)	(N = 71)	(N = 84)	(N = 39)	(N = 14)
Deciles					
+2	+3	+4	+2	+3	+4
sign. lower BAS (p < 0.05)	sign. lower BAS (p < 0.1)	no relationship	no relationship	no relationship	no relationship
(N = 80)	(N = 54)	(N = 22)	(N = 66)	(N = 43)	(N = 27)
Quintiles					
+1	+2	+3	-1	-2	-3
sign. lower BAS (p < 0.05)	sign. lower BAS (p < 0.05)	no relationship	no relationship	no relationship	no relationship
(N = 102)	(N = 34)	(N = 7)	(N = 83)	(N = 34)	(N = 6)
<i>Notes.</i> This table shows the regression results for the relationship between an increase/decrease in forward-looking reporting quality and the bid-ask spread. N is the number of firms with a change. BAS refers to bid-ask spread.					

Table 28: Relationship Between Disclosure Quality Changes and Bid-Ask Spread

The results show that companies with improved disclosure quality have significantly lower bid-ask spreads than those with constant quality, if the change is not very high. And a decrease in information asymmetry due to a positive change in reporting quality is in line with related work. Healy et al. (1999) also show lower bid-ask spreads for firms with improved reporting quality compared to those with a constant level. For firms with decreasing quality, I find no relationship between the bid-ask spread and a change in quality. To the best of my

⁶⁴ Appendix 7 gives detailed results of the all regression analyses for a quality decrease.

knowledge, prior research had not addressed this issue. Thus, my results cannot be compared to earlier work.

To validate my results I conduct different additional tests.⁶⁵ I exclude five severe outliers. The exclusion does not affect the results of a decrease in disclosure quality (percentage, decile and quintile). For the increase in disclosure quality, the percentage increase models are not affected either. For the increase in deciles and quintiles, the results are still significant, only slight less significant.

Using the change in the scope index instead of the quality index, minimal variations of the results can be observed. The increase of more than 30% and the increase of one and two quintiles are not significant compared to the original models indicating, that using a different weighting for the disclosure index leads to slightly different results.

Using the issuance date of the annual report as a starting point for the calculation of the variables does not affect the results to a great extent. The only interesting point while using the individual starting point is that a percentage increase of more than 70% leads to a significant lower bid-ask spread with coefficient (t-value) of -0.150 (-1.73), while a decrease of more than 70% leads to a significant higher bid-ask spread with coefficient (t-value) of 0.350 (2.42).

Using a different window length, only the increase in one decile is a little less significant than in the original model. For all the other models the results stay the same, indicating that a different window length does not affect the results.

4.6.3.2 Pre- and Post-Period Comparisons

I conduct two regressions for the pre- and post-periods, one for an increase in disclosure quality level and one for a decrease. In both cases, I consider only increasing and decreasing firms, and I compare their bid-ask spreads both before

⁶⁵ These robustness tests are comparable to those conducted in 4.6.2.1-4.6.2.3. For more details, see 4.6.2.1-4.6.2.3.

(2005-2007) and after (2008-2009) the changes. I use a dummy variable, *POST*, to denote the pre- and post-period situations.

As Table 29 shows, companies with improved reporting quality of more than 30% exhibit a significantly lower bid-ask spread afterward (coefficient = -0.167, t-statistic = -1.91). The same is true for firms with improvements of more than 50% (coefficient = -0.281, t-statistic = -3.01), 2 deciles (coefficient = -0.225, t-statistic = -2.26), and one quintile (coefficient = -0.211, t-statistic = -2.52). However, I find no relationship for firms with large improvement levels (+70% and +3 deciles). I find that improvements of four deciles, two quintiles, and three quintiles could not be measured in a regression analysis, because the number of observations is too small (see section 4.5.1).

$$\log\text{BAS}_{jt} = \beta_0 + \beta_1 \log\text{MV}_{jt} + \beta_2 \log\text{PRICE}_{jt} + \beta_3 \log\text{TURN}_{jt} + \beta_4 \log\text{RET}_{jt} + \beta_5 \log\text{FF}_{jt} + \sum_{k=1}^8 \alpha_k \beta_6 \text{IND}_j + \text{POST}_t + \beta_8 \text{OI}_{jt} + \varepsilon_{jt}$$

	Percentage Change			Decile		Quintile
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	+30% (N = 44)	+50% (N = 24)	+70% (N = 16)	+2 (N = 32)	+3 (N = 16)	+1 (N = 42)
Intercept	-5.270*** (-6.56)	-4.163* (-2.02)	-3.222 (-0.95)	-5.674*** (-5.88)	-1.488 (-0.42)	-5.113*** (-8.40)
$\log\text{MV}_{jt}$	-0.525*** (-9.75)	-0.643*** (-5.31)	-0.423 (-0.93)	-0.463*** (-11.05)	-0.990*** (-5.70)	-0.482*** (-13.88)
$\log\text{PRICE}_{jt}$	0.005 (0.05)	-0.134 (-0.65)	0.034 (0.08)	-0.032 (-0.17)	0.555 (1.41)	-0.133 (-1.15)
$\log\text{TURN}_{jt}$	-0.546*** (-8.14)	-0.527*** (-2.97)	-0.082 (-0.20)	-0.611*** (-5.96)	0.168 (0.57)	-0.585*** (-8.01)
$\log\text{RET}_{jt}$	0.066 (0.54)	0.243 (1.17)	0.030 (0.08)	0.069 (0.37)	-0.397* (-2.03)	0.044 (0.33)
$\log\text{FF}_{jt}$	-0.149 (-0.91)	-0.203 (-0.94)	-0.278 (-0.27)	0.281 (1.64)	-1.728* (-2.08)	0.301** (2.64)
POST_t	-0.167* (-1.91)	-0.281*** (-3.01)	-0.174 (-0.88)	-0.225** (-2.26)	-0.072 (-0.58)	-0.211** (-2.52)
Industry fixed effects	yes	yes	yes	yes	yes	yes
R ²	95.4%	97.3%	96.7%	96.8%	98.3%	96.1%
Adj. R ²	93.9%	94.8%	87.5%	94.8%	95.0%	94.5%

Notes. This table shows the regression analysis for a pre- and post-analysis for companies with improved forward-looking disclosure quality.

For the multivariate analysis, the coefficients are given with t-statistics in parentheses. The standard errors are heteroskedasticity-robust, and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: $\log\text{BAS}_{jt}$ = the log of firm j 's year t bid-ask spread, measured as the firm's average daily bid-ask spread over the fourth months following the year-end; $\log\text{MV}_{jt}$ = the log of firm j 's year t market value at the end of the fourth month following the year-end; $\log\text{PRICE}_{jt}$ = the log of firm j 's year t stock price at the end of the fourth months following the year-end; $\log\text{TURN}_{jt}$ = the log of firm j 's year t daily turnover, averaged over the fourth month following the year-end; $\log\text{RET}_{jt}$ = the log of firm j 's year t standard deviation of stock returns over the fourth month following the year-end; $\log\text{FF}_{jt}$ = the log of firm j 's year t free float at the end of the fourth month following the year-end; $\text{POST}_t = 1$ for the year after the reporting quality increase, and 0 for the pre-change period (the variable is calculated individually for each of the six models).

Table 29: Pre- and Post-Period Comparison for Firms with Improved Disclosure Quality Levels

Table 30 shows the results for firms with decreasing levels of forward-looking disclosure quality from the pre- to the post-period. Note that firms with decreasing quality levels also exhibit significantly lower bid-ask spreads than before the change. For a decrease of more than -30%, the bid-ask spread is significantly lower (coefficient = -0.309, t-statistic = -3.50), as well as for a decrease of more than -50% (coefficient = -0.324, t-statistic = -2.88). Also, for decreases of more than two, three and four deciles and one and two quintile(s), the bid-ask spread is significantly lower after the change. I find that decreases of more than 70% could not be measured in a regression analysis, because the number of observations is too small (see section 4.5.1).

The findings are not in line with theory, however, which find that a decrease in quality should lead to higher bid-ask spreads. Surprisingly, the significance levels are higher even than those for the *POST* variable in a quality improvement scenario. To the best of my knowledge, prior research has not explicitly considered a decrease in quality from one period to the next. Thus, my results are again not comparable to prior work.

$$\log\text{BAS}_{jt} = \beta_0 + \beta_1 \log\text{MV}_{jt} + \beta_2 \log\text{PRICE}_{jt} + \beta_3 \log\text{TURN}_{jt} + \beta_4 \log\text{RET}_{jt} + \beta_5 \log\text{FF}_{jt} + \sum_{k=1}^8 \alpha_k \beta_6 \text{IND}_j + \text{POST}_t + \beta_8 \text{OI}_{jt} + \varepsilon_{jt}$$

	Percentage Change		Deciles			Quintile(s)	
	Model 1 -30% (N = 64)	Model 2 -50% (N = 24)	Model 3 -2 (N = 64)	Model 4 -3 (N = 38)	Model 5 -4 (N = 18)	Model 6 -1 (N = 70)	Model 7 -2 (N = 28)
Intercept	-5.288*** (-9.12)	-4.973*** (-5.10)	-5.489*** (-11.55)	-5.529*** (-5.11)	-5.812*** (-3.16)	-5.384*** (-10.90)	-4.944*** (-4.79)
logMV _{jt}	-0.447*** (-12.70)	-0.451*** (-8.00)	-0.399*** (-12.45)	-0.424*** (-12.82)	-0.417*** (-5.14)	-0.389*** (-11.98)	-0.373*** (-6.56)
logPRICE _{jt}	-0.263** (-2.11)	-0.200 (-1.27)	-0.175 (-1.55)	-0.272* (-1.74)	-0.104 (-0.40)	-0.214* (-1.87)	-0.088 (-0.54)
logTURN _{jt}	-0.710*** (-9.12)	-0.567*** (-4.46)	-0.594*** (-11.19)	-0.695*** (-3.67)	-0.631* (-1.76)	-0.597*** (-12.01)	-0.409** (-2.27)
logRET _{jt}	0.192* (1.78)	0.130 (0.80)	0.127 (1.37)	0.181 (1.38)	0.058 (0.20)	0.152 (1.53)	-0.047 (-0.28)
logFF _{jt}	0.144 (0.73)	-0.249 (-0.78)	-0.067 (-0.52)	-0.005 (-0.02)	-0.020 (-0.02)	-0.054 (-0.41)	-0.406 (-1.01)
POST _t	-0.309*** (-3.50)	-0.324*** (-2.88)	-0.182** (-2.28)	-0.288** (-2.50)	-0.249* (-2.08)	-0.202** (-2.56)	-0.199** (-2.42)
Industry fixed effects	yes	yes	yes	yes	yes	yes	yes
R ²	91.3%	95.2%	91.2%	91.1%	92.8%	90.4%	90.9%
Adj. R ²	89.2%	92.1%	89.1%	87.3%	84.7%	88.4%	85.5%

Notes. This table shows the regression analysis for a pre- and post-analysis for companies with decreasing forward-looking disclosure quality.

For the multivariate analysis, the coefficients are given with t-statistics in parentheses. The standard errors are heteroskedasticity-robust, and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: logBAS_{jt} = the log of firm j's year t bid-ask spread, measured as the firm's average daily bid-ask spread over the fourth months following the year-end; logMV_{jt} = the log of firm j's year t market value at the end of the fourth month following the year-end; logPRICE_{jt} = the log of firm j's year t stock price at the end of the fourth months following the year-end; logTURN_{jt} = the log of firm j's year t daily turnover, averaged over the fourth month following the year-end; logRET_{jt} = the log of firm j's year t standard deviation of stock returns over the fourth month following the year-end; logFF_{jt} = the log of firm j's year t free float at the end of the fourth month following the year-end; POST_t = 1 for the year after the reporting quality increase, and 0 for the pre-change period (the variable is calculated individually for each of the seven models).

Table 30: Pre- and Post-Period Comparison for Firms with Decreased Disclosure Quality Levels

4.7 Summary

This chapter analyzes the relationship between German forward-looking disclosure quality and information asymmetry as reflected by the bid-ask spread. I extend related work by focusing explicitly on forward-looking reporting disclosures. My approach goes further because it is able to consider a greater variety of forecasts from forward-looking reports. Information disclosed in forward-looking report tends to be more extensive because it concentrates on different facets of a firm's possible future.

Agency theory suggests that better disclosure will lead to a reduction in bid-ask spreads. My results show a significantly negative relationship between bid-ask spreads and forward-looking disclosure quality, indicating lower information asymmetries for firms with higher reporting quality. However, this relationship does not hold when I control for the quality of other information released in the annual report. Thus, I posit that some of the information contained in a forward-looking report is already included in other parts of the annual report. But the results of the basic model (without controlling for other information) are stable to various modifications. The results are even stronger when using a longer measurement window for the variables.

Additionally, I explore whether a change in the level of forward-looking disclosure quality affects the bid-ask spread. First, I compare firms that have experienced a change in quality from one year to the next with firms whose levels have maintained stable. I find that firms with changes from lower to higher levels exhibit significantly lower bid-ask spreads, if the change in quality is not very high. Firms with changes from higher to lower levels do not exhibit any relationship with bid-ask spreads. The results are stable for the different definitions of change (percentage, decile, and quintile).

I next examine two subperiods, which I refer to as the pre-period (2005-2007) and the post-period (2008-2009). I compare the bid-ask spreads for both periods

for firms changing their level of quality. The results for most change variables provide evidence that both an increase and a decrease in the level of disclosure quality lead to lower bid-ask spreads in the post-change period. For firms with increased quality levels, these results are not surprising. However, for firms with decreased quality levels, the results are not in line with theory.

My results show the importance of forward-looking reporting. My findings are especially interesting in light of the GAS 15 revision, and the introduction of the practice statement *Management Commentary* by the IASB. This study provides valuable insights for regulators to improve existing regulations and to develop new ones. Clearer regulations should lead to more disclosure transparency, and could reduce information asymmetries. My study thus provides indications and suggestions for commenting on D-GAS 27. For example, a minimum requirement for important ratios (i.a. earnings, revenues) could be mandated.

This study faces some limitations, however. First, it is possible that some of the information in forward-looking reports is not new. It may have been released already, e.g., as a press release or part of an analyst announcement. Thus, the effect of the forward-looking reporting quality on the bid-ask spread cannot be clearly separated. Future studies could examine any overlap of information and determine how to address it. Second, how to properly define an increase (decrease) in reporting quality is a particular challenge. Future research could delve into this issue in a more detailed way, especially combined with a larger sample. Third, the size of my sample, especially the firms with reporting changes, is quite small. Further research could enhance my study by using a larger sample in order to obtain more observations for these companies. And fourth, my results are valid for the German market and for the particular vehicle of forward-looking reporting. However, the generalizability of my results to other countries is not certain, because of the variety of different regulations and situations in other countries.

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5 Conclusion

5.1 Summary

The dissertation's intention was to show disclosure measurement, the determinants, and the consequences of German forward-looking reporting. I analyzed these three aspects individually in three studies.

The first step, in chapter 2, showed how disclosure indices are used in related work, and how to compile self-constructed indices. This includes measuring the different disclosure practices of German firms in the forward-looking reports. I therefore used three different disclosure measures: quality, scope, and quantity. The research question for chapter 2 was:

What are the characteristics of disclosure indices, and how do differences in self-constructed indices occur?

I review the various characteristics of disclosure indices. For self-constructed indices, I analyze the options and difficulties researchers are facing. In the practical section, I show how to self-construct disclosure indices, using quality, scope, and quantity indices. To measure quality and scope, I use a disclosure index with items that capture the forward-looking reporting behavior. Both indices contain the same items, but they differ in the weighting of the quantitative information.

In the scope index, all items have the same weights, but I distinguish between whether items are present or absent from the forward-looking report. In the quality index, I evaluate the quantitative information using different weights that are dependent on ex ante forecast precision. Quantity is measured by the number of words contained in the forward-looking report.

I use the 2005-2009 period to analyze the disclosure indices. I find that quality and scope disclosure index scores develop similarly over time, showing an increase from 2005 through 2007, a decrease in 2008, and an increase again in

2009. The results seem intuitive, as the indices only differ in their weighting of quantitative information.

In ranking the firms downward according to their disclosure scores, I find only slight differences between the quality and scope indices. The top 10 companies are the same for both, with small differences in positioning. Applying the quantity measure, however, I find that it develops differently over time (showing a constant increase in the number of words from 2005 through 2009). I also note different firm rankings than for the quality and scope indices.

My second step, in chapter 3, was based on the three disclosure measures of quality, scope, and quantity. I explore how the extreme uncertainty caused by the global financial crisis affected disclosure behavior. I analyze the quality, scope, and quantity of forward-looking disclosures during crisis and non-crisis periods. I additionally control for other determinants of disclosure behavior, such as, e.g., firm size, ownership structure, and return on equity. The research question for chapter 3 was thus:

How does the global financial crisis affect the quality, scope, and quantity of German forward-looking reports?

The results show that disclosure quality and scope significantly decreased during the crisis. In contrast, the quantity measure increased constantly over this time. Thus, firms continued to disclose during the crisis in terms of volume (measured by the number of words in the annual report), but the ex ante forecast precision of quantitative information and the reported number of different items decreased.

Analyzing the other control variables, I find a significant relationship between quality/scope and firm size, and for performance. I interpret these results to mean that larger firms have a significantly higher level of forward-looking disclosure quality and scope. Firms with more volatile performance have significantly lower levels. The relationship between quantity and the control variables varies, and

shows significant values with the expected signs for the variables firm size, closely held shares, and return on equity.

The third step of my thesis, in chapter 4, was to analyze the relationship between disclosure quality and information asymmetry. I use the bid-ask spread, a common measure for information asymmetry in prior research, as a proxy. I also used common control variables, as well as the “other information” variable (which includes all the other information in the annual report besides the forward-looking report), in my analysis. The research question for chapter 4 was thus:

How does forward-looking reporting quality influence information asymmetry, as proxied for by the bid-ask spread?

The results show a significantly lower bid-ask spread for firms with better forward-looking disclosure quality. They are robust to various modifications, such as, e.g., the use of disclosure scope instead of quality, or the use of a different time horizon for the measurement of the variables. When I include the other information variable in the regression model, I find that the relationship of forward-looking disclosure quality and bid-ask spreads is no longer significant. This non-significant relationship remains valid for different sensitivity analyses.

In a further examination, I study the change in the level of forward-looking disclosure quality from one year to the next, as well as the relationship with bid-ask spreads. I find that firms that have significantly improved their level of quality face lower bid-ask spreads, as long as the change in quality is not too high. Improvements above a certain threshold do not lead to lower bid-ask spreads. For firms with decreasing levels of quality, I find no relationship.

I further consider two subperiods within the 2005-2009 timeframe, which I classify as the pre-period (before the financial crisis) (2005-2007), and the post-period (2008-2009). I analyze firms that have changed their level of forward-looking reporting quality from the pre-period to the post-period. The results show that firms with improved quality levels face significantly lower bid-ask spreads in

the post-period. However, for firms with decreased quality levels, I also find significantly lower bid-ask spreads in the post-period. For firms with increased quality, the result is in line with theory. For firms with decreased quality, the results are not as expected and are not in line with theory.

5.2 Limitations and Further Research

My studies naturally face some limitations. The data are hand-collected, and thus only allow for the analysis of a limited number of forward-looking reports. It would be interesting to extend my sample size and analyze the reports for a larger number of firms, including more mid-size and smaller listed firms, to examine whether their reporting behavior differs significantly from the large companies included here.

The extension of the sample would also improve the number of companies with changes in forward-looking reporting quality. In my analysis, the number of companies with strong increases or decreases is quite low. It could also improve the statistical power and the stability of the results in my empirical analysis.

Another limitation is that there is no common definition for forward-looking disclosure quality and scope. I chose a definition with a focus on company-specific forward-looking information that seems to be most appropriate to answer my research questions about the determinants and consequences of forward-looking disclosures. Furthermore, the index construction is based on differing opinions. Although they are constructed to be as objective and transparent as possible, others may feel that only people who agree with my construction method would find them useful for the analyses.

It is also questionable, and perhaps not clear enough, whether the character of the disclosed information in the forward-looking report is current enough. For example, some information may have been disclosed already in other vehicles, such as, e.g., press releases, interim reports, or other announcements. However, I find that controlling for all forward-looking information disclosed would not be

suitable for my research purposes. The focus of my research is examining the particular vehicle of German forward-looking reporting because it has such a unique and exceptional setting.

I note further that, for the study in chapter 3, there could be other variables included as determinant factors, such as, e.g., management's personal reporting decisions, or the company's stated disclosure policy. However, the observability of these factors could be a problem because they are not externally available.

And the study in chapter 4 is limited with respect to the definition of a change in quality. Because there is no common consensus on how to define higher or lower levels of quality, different options are used in the analysis to proxy for the change.

To further advance the research on forward-looking disclosures, I propose several avenues. First, researchers could enhance the existing studies by considering other forward-looking information besides the forward-looking report. For example, interim forward-looking reporting, earnings forecasts, press releases, or analyst forecasts could be analyzed. All of this information can complement the information in the forward-looking report.

Second, for self-constructed indices, the focus on computer-based approaches, especially on statistical approaches, should be developed further to undertake larger-scale analyses and to increase the comparability of research studies and the generalizability of results.

Third, a particularly interesting aspect to analyze is the background of companies' forward-looking reporting behavior. Knauer and Wömpener (2011) have already analyzed firms' disclosure behavior for nine firms and six auditing firms. But less is known about their decision making processes for disclosures.

Fourth, my analysis is only valid for Germany and the forward-looking report. Subsequent studies could extend my research to a cross-country level in order to

compare the reporting behavior of firms in other countries with my German results.

Research in these fields would supplement the findings of my study and lead to a better understanding of forward-looking reporting disclosures. This could significantly enhance the research in this important field.

Appendix

Appendix 1: Tabulated Overviews of Prior Research

a) Research Using Reporting Volume as Disclosure Proxy

	Research question	Sample size	Time frame	Findings	Measure
Number of words					
Ewelt et al. (2009)	Examination of the determinants of risk-reporting.	91	2007	Large firms, firms with a low profitability and firms listed on the US-market show a higher level of risk disclosure.	Number of words of the risk report.
Ruhwedel et al. (2009)	Descriptive analysis of the development of the volume of the forward-looking report.	90	2006-2008	Volume of the reports increases over time.	Number of words of the forward-looking report.
Number of rows					
Knauer and Wömpener (2010)	Descriptive analysis of the development of the volume of the forward-looking report.	605	2005-2008	Volume of the reports increases over time and marginally decreases in 2008.	Number of rows of the forward-looking report.
Number of sentences					
Aljifri and Hussainey (2007)	Examination of the determinants of forward-looking information.	46	2004	Firms with a low profitability and a high leverage show a higher level of forward-looking disclosure.	Number of forward-looking sentences.
Celik et al. (2006)	Examination of the determinants of forward-looking information.	233	2004	Firm structure, profitability, level of foreign investment and proportion of institutional investors are significantly associated with the level of forward-looking disclosure.	Number of forward-looking sentences.
Entwistle (1999)	Disclosure of R&D information.	113	1994	Higher current year R&D expenses and firms that are cross-listed show a higher level of R&D disclosure.	Number of sentences containing R&D information.

Williams (1999)	Examination of cross-country differences of voluntary environmental and social disclosure in the Asia-Pacific region.	356	1995	Significant variation of the level of disclosure across the examined countries.	Number of sentences containing environmental and social disclosure information.
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b) Research Using Computer-Based Methods

	Research question	Sample size	Time frame	Findings	Method
Beattie et al. (2004)	Examination of computer-based content analysis based on a four dimension framework.	1	1999	Suggestions of new measurement methods.	<i>Nudist</i> , for splitting the text into several units. Additionally it is used as an analysis tool, after manual coding.
Beattie and Thomson (2007)	Examination of a manual content analysis and an electronically keyword search.	1	2004	Manual analysis is superior.	Electronic keyword search (program is not named explicitly in the study).
Bontis (2003)	Examination of the extent of intellectual capital disclosure.	10,000	1999	Only 74 intellectual capital terms were used by 10,000 firms.	<i>Compact D: Cancorp Plus</i> , as keyword search.
Huang et al. (2010)	Examination of tone and content of analyst reports and its implications.	389,096	1995-2008	Investors put twice as much weight on negative information given in analyst reports than on positive information.	<i>Naïve Bayesian machine learning algorithm</i> , to analyze the tone and content.
Hussainey et al. (2003)	Examination whether the disclosure quality affects the strength of the relation of current stock returns and future earnings changes.	3,150	1996-1999	No association for the predicted relation is found.	<i>Nudist</i> , for classifying the disclosed information.
Grüning (2010)	Examination of the capital market consequences of corporate disclosure.	348-361	2006	Firms with a higher disclosure level face lower bid-ask spreads and higher market liquidity.	<i>Artificial Intelligence Measurement of Disclosure</i> , for analyzing the disclosure quality of the annual reports.

Kothari et al. (2009)	Examination of the consequences of financial disclosure on the cost of equity capital, return variability and on analyst forecast error dispersion.	326,357	1996-2011	Negative (positive) disclosure in the business press leads to increased (decreased) cost of equity capital and return volatility.	<i>General Inquirer</i> , for the distinction of favorable/unfavorable disclosure.
Li (2010)	Examination of the determinants of the tone and content of forward-looking information in 10-K and 10-Q filings.	140,000	1994-2007	Firms with a better current performance, lower accrual, smaller firm size, lower market-to-book ratio, less return volatility, lower MD&A Fog index and longer history are more likely to have more positive forward-looking reports.	<i>Naïve Bayesian machine learning algorithm</i> , to analyze the tone and content.

c) **Research Using Weighted disclosure indices**

	Research question	Sample size	Time frame	Findings	Form of weighting
International					
Botosan (1997)	Examination of the relationship between the level of disclosure and the cost of equity capital.	122	1990	For firms with a low analyst following a higher level of disclosure leads to a lower cost of equity capital.	Quantitative information is weighted more heavily.
Bozzolan and Mazzola (2007)	Examination whether forward-looking disclosures are associated with financial analyst activities.	141	2003-2006	Increase of the extent of quantitative forward-looking information increases forecast accuracy. Narrative disclosure leads to a reduction of accuracy.	Forecast precision is measured by a score between 0 for non-disclosing and 4 for a point estimate.
Buzby (1975)	Examination of the relationship between financial disclosure and firm size and listing status.	88	1970/71	Larger firms show a higher level of voluntary financial disclosure. Listing status does not affect the level of voluntary disclosure.	Survey among 150 financial analysts (response rate 21.3%).
Coy (1993)	Examination of the quality of corporate disclosure of university annual reports.	33	1985-1990	Improvement of the disclosure quality over time.	Weighting importance on a scale of 1-3, quality of information on a scale of 1-3.
Chow/Wong-Boren (1987)	Examination of the determinants of voluntary financial disclosure.	52	1982	Larger firms show a higher level of voluntary financial disclosure.	Survey among 106 loan officers (resp. rate 63%).
Naser and Nuseibeh (2003)	Examination of the compliance with the accounting standard.	40/52	1992 and 1998	Compliance with mandatory requirements is high; the reporting of voluntary information is low. Differences between weighted and unweighted index.	Survey among seven different user groups.
Prencipe (2004)	Examination of the determinants of voluntary segment disclosure.	64	1997	Larger firms, firms with a higher ownership diffusion, firms with a higher age of the listing	Survey among 400 financial analysts (response rate 14%)

				status and firms with a higher leverage show a higher level of voluntary segment disclosure.	
Robb et al. (2001)	Examination of the determinants of non-financial disclosure.	192	1995	Larger, more internationally oriented firms show a higher level of non-financial disclosure. Companies within the chemical industry also provide more information.	Weighting the importance of items between 1 and 3.
Robbins and Austin (1986)	Examination of the determinants of disclosure quality in governmental financial reports.	99	1981-1982	In both indices the same variables show a significant association with disclosure quality.	Survey of 200 analysts (response rate 39%).
Singhvi and Desai (1971)	Examination of the quality of corporate financial disclosure.	155	1965/66	Larger firms, firms with a higher profitability, audited by a larger firm and listed firms show a higher level of corporate financial disclosure.	Interview of experts on the weighting between 1 to 4 for the disclosure index.
Stanga (1976)	Examination of the determinants of disclosure in annual reports.	80	1973	Positive relationship between firm size and disclosure.	Survey among 800 CFAs (response rate 34.4%).
Germany-related					
Barth and Beyhs (2010)	Examination of the development of forward-looking disclosure over time.	678	2004-2009	Decreased disclosure quality in 2008, characterized by a high variation between firms.	Survey among auditors and financial analysts.
Wasser (1976)	Examination of the determinants of forward-looking disclosure.	100	1968-1971	Larger firms, firms with a higher number of shareholders, and a higher market share are more likely to provide a higher level of disclosure.	Ex ante forecast precision is measured by a score between 0 for non-disclosing and 4 for a point estimate.

d) Research Addressing Validity and/or Reliability Measures

	Research Question	Sample	Time Frame	Findings	Reliability Measure	Validity Measure
Beattie et al. (2004)	Examination of computer-based content analysis based on a four dimension framework.	1	1999	Suggestions of new measurement methods.	Scott's pi	Usage of prior frameworks and research as basis.
Beretta and Bozzolan (2008)	Examination of the association of forward-looking disclosure with analyst forecast revisions.	255	1999-2001	A higher forward-looking disclosure quality leads to an increase of the accuracy of earnings forecasts.	Krippendorff's alpha	Significant relationship between disclosure quality index and properties of analyst earnings forecasts.
Mohd Gazil and Weetman (2006)	Examination of the determinants of voluntary disclosure in annual reports	87	2001	A higher percentage of director ownership is associated with a higher level of voluntary disclosure.	Consulting of a third person if discrepancies between coders arise.	-

e) **Research Using AIMR/FAF Index**

	Research question	Sample size	Time frame	Findings
Botosan and Plumlee (2002)	Examination of the relationship between disclosure and the cost of equity capital.	3,618	1985/1986-1995/1996	Higher levels of annual report disclosure lead to lower cost of equity capital. For other publications, either higher costs of equity capital or no relationship is found.
Brown and Hillegeist (2007)	Examination of the relationship between the quality of firm disclosure and information asymmetry.	2,204	1986-1996	Significant negative relationship between disclosure level and information asymmetry.
Drake et al. (2009)	Examination of the relationship between disclosure quality and the mispricing of accruals and cashflows.	3,373	1982-1996	Firms with a lower disclosure quality exhibit significant accrual and cashflow mispricing.
Healy et al. (1999)	Examination whether firms can significantly reduce the information asymmetry while improving the level of disclosure.	595	1978-1991	Firms increasing their disclosure level face improved stocks and lower information asymmetries.
Lang and Lundholm (1993)	Examination of the determinants of voluntary disclosure.	1,187, 1,235, 1,235, and 1,889 ⁶⁶	1985-1989	Firms with higher disclosure scores are larger, issue securities, perform well, and have a weaker relation between annual stock returns and earnings.
Sengupta (1998)	Examination of the relationship between disclosure quality and cost of debt.	114 (103) ⁶⁷	1987-1991	Firms with higher disclosure face lower cost of debt.
Welker (1995)	Examination of the relationship between spreads as a proxy for information asymmetry and the general level of disclosure.	1,639	1983-1990	Significant negative relationship between bid-ask spread and disclosure.

⁶⁶ The sample size varies according to the score used: annual report, other publications, investor relations or total score.

⁶⁷ 103 for an inclusion of another variable.

f) **Research on Forward-Looking Disclosure Determinants**

	Research question	Sample size	Time frame	Findings	Forecast form
International					
Ajinkya et al. (2005)	Examination of the relationship of board of directors/ institutional ownership with management earnings forecast properties.	varies	1997-2002	Firms with a higher number of institutional owners are more likely to provide a higher ex ante forecast precision.	Earnings
Aljifri and Hussainey (2007)	Examination of the determinants of forward-looking information.	46	2004	Firms with a low profitability and a high leverage show a higher level of forward-looking disclosure.	FLI
Baginski et al. (2004)	Examination, why managers choose to provide attributions with their forecast.	951	1993-1996	Large firms and firms in less regulated industries are more likely to explain earnings forecasts. Additionally, firms with bad news forecasts and maximum-type forecast rather give explanations. Long-term forecasts are less likely to be accompanied by explanations.	Earnings
Celik et al. (2006)	Examination of the determinants of forward-looking information.	233	2004	Significant influence on FLI: structure, profitability, the level of foreign investment and the proportion of institutional investors.	FLI
Choi et al. (2010)	Examination of the relationship between forecast precision and forecast surprise and its determinants.	16,872 ⁶⁸	1995-2004	Firms with lower earnings volatility and lower forecast surprise provide a higher ex ante forecast precision.	Earnings

⁶⁸ Management earnings forecasts.

Clarkson et al. (1999)	Examination, why some firms include directional forecasts in their annual reports while others do not.	905	1989-1991	Good news firms increase disclosure, when they need external financing and decrease disclosure when they face competitors entering the market. For bad news firms the disclosure extent is the opposite.	Earnings
Hossain et al. (2005)	Examination of the relationship between the level of disclosure of prospective information and the investment opportunity.	245	1991-1995	Disclosure of forward-looking information is significantly associated with investment opportunities.	FLI
Kent and Ung (2003)	Examination, why Australian companies voluntarily disclose forward-looking earnings information.	117	1991/1992	Firms with less volatile earnings and larger firms are more likely to give earnings forecasts.	Earnings
Li (2010)	Examination of the determinants of the tone and content of forward-looking information in 10-K and 10-Q filings.	140,000	1994-2007	Firms with a better current performance, lower accrual, smaller firm size, lower market-to-book ratio, less return volatility; lower MD&A Fog index and longer history are more likely to have more positive forward-looking reports.	FLI
Germany					
Barth (2009)	Analyzing the disclosure reporting before and after the adaption of BilReG/GAS 15.	336	2004-2006	Increase of reported items over time. Size as a significant factor on disclosure.	FLR
Barth and Beyhs (2010)	Examination of the development of forward-looking disclosure over time.	678	2004-2009	Decreased disclosure quality in 2008, characterized by a high variation between firms.	FLR

Knauer and Wömpener (2010)	Descriptive analysis of the development of the volume of the forward-looking report over time. Examination of the fulfillment of earnings and revenue forecasts in subsequent periods.	605	2005-2008	Volume of the reports increases over time and marginally decreases in 2008. The ex-post accuracy between 2005 and 2007 is 38.8% for earnings and 41.0 for revenue forecasts.	Earnings and Revenues
Knauer and Wömpener (2011)	Survey to examine the companies' forecasting behavior.	9 firms, 6 audit firms		Firms reporting behavior changed due to the financial crisis. Forecasts are less precise and qualitative statements are used more often in crisis periods.	FLR
Nölte (2009)	Examination of the determinants of management forecasts.	2000	2002-2005	Firms with a low percentage of intangible assets, a low EPS-volatility, a low volatility of the prior year earnings, a higher market to book value, and a higher need for external financing provide more precise forecasts.	Management forecasts
Ruhwedel et al. (2009)	Descriptive analysis of the development of the volume and precision of the forward-looking report.	90	2006-2008	Volume of the reports increases over time. Forecast precision declines over time.	FLR
Wasser (1976)	Examination of the determinants of forward-looking disclosure.	100	1968-1971	Larger firms, firms with a higher number of shareholders, and a higher market share are more likely to provide a higher level of disclosure.	FLR

Appendix 2: List of Items

CATEGORY I: ENVIRONMENT	Capital market oriented figures
Environmental conditions	Dividend forecast
Expected prospects for the economy	EPS forecast
Expected prospects for the industry	Investment
CATEGORY II: COMPANY SPECIFIC FORECASTS	Investment forecast
Company strategy	Naming major events
Changes in operating policies	Naming major investments
Development of new sales markets	Research and Development
Use of new processes	R&D forecast
Introduction of new products/services	Segment
Sales	Segment differentiation
Revenue	Segment revenue forecast
Revenue forecast	Segment earnings forecast
Earnings	CATEGORY III: OTHER
Earnings forecast	Other
Profit or loss	Market situation
Interest expenses	Overall conclusion
Cost of debt	Major assumptions
Tax rate	Description of forecasting methods
Costs	Disclaimer
Depreciation	
Expenses	
Cashflow	
Cashflow forecast	
Efficiency	
Efficiency forecast	
Employees	
Employees forecast	
Purchase	
Purchase forecast	
Financing	
Financing by operating cash flow	
Capital increase/financial requirements	
Share repurchase	
Leverage	
Debt to equity ratio	
Equity ratio	

Appendix 3: Annual Report Examples for Disclosure Classification

Example Category 1:

“The world economy is expected to continue to expand in 2007, although the 3.9 percent world growth achieved in 2006 is likely to slow down to 3.3 percent in 2007” (Lufthansa 2006, 107)

Example Category 2a:

“Future use of new processes: We are constantly working on process improvements to increase productivity; raw material exploitation and energy efficiency are the focus here [...]” (K+S 2007, 109).

Example Category 2b:

“We set the growth revenue of the Group at around EUR 520 million [...] in 2009” (Phoenix Solar 2008, 66).

One point is assigned for forecast horizon information (2009), 4 points for the point forecast (520 million), and 1 point for economic direction, as the trend (growth) is mentioned.

Example Category 3:

“General statement on the anticipated development of the Group: Software AG is extremely well positioned for the future [...]” (Software 2008, 54).

Appendix 4: Sensitivity Analyses

a) Winsorizing at 1% Level

	Exp. sign	QUAL_W1 _{jt} (N=442)	SCOPE_W1 _{jt} (N=442)	QUAN_W1 _{jt} (N=442)
Intercept		25.699*** (2.75)	6.336 (1.49)	-645.244 (-1.27)
SIZE_W1 _{jt}	+	1.354*** (2.77)	1.012*** (4.18)	172.730*** (6.20)
CHS_W1 _{jt}	-	-1.081 (-0.27)	1.227 (0.61)	-310.607 (-1.58)
LEV_W1 _{jt}	?	-0.040 (-0.82)	-0.040 (-1.63)	3.696 (1.41)
ROE_W1 _{jt}	?	0.002 (0.03)	-0.002 (-0.08)	-10.083*** (-3.37)
VOLA_W1 _{jt}	-	-1.228*** (-2.67)	-0.481* (-1.92)	8.643 (0.24)
AUD_W1 _{jt}	+	-0.359 (-0.14)	1.703 (1.39)	56.669 (0.49)
CRISIS_W1 _t	-/? ⁶⁹	-5.668*** (-2.76)	-1.928* (-1.79)	162.489 (1.42)
Industry fixed effects		yes	yes	yes
R ²		10.5%	14.9%	22.4%
Adj. R ²		7.5%	12.2%	19.9%

Notes. This table shows the OLS analysis for forward-looking disclosure and its determinants.

For the multivariate analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity-robust and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: QUAL_W1_{jt} = firm j's year t absolute forward-looking disclosure quality index winsorized at the 1% level; SCOPE_W1_{jt} = firm j's year t absolute forward-looking disclosure scope index winsorized at the 1% level; QUAN_W1_{jt} = firm j's year t absolute forward-looking disclosure quantity measure winsorized at the 1% level; SIZE_W1_{jt} = the log of firm j's total assets at the end of fiscal year t winsorized at the 1% level; CHS_W1_{jt} = firm j's percentage of equity owned by the insiders to all equity of the firm at the end of fiscal year t winsorized at the 1% level; LEV_W1_{jt} = firm j's total debt divided by the total assets at the end of fiscal year t winsorized at the 1% level; ROE_W1_{jt} = firm j's return on equity (net income before preferred dividends - preferred dividend requirement) / average of last year's and current year's common equity * 100) at the end of fiscal year t winsorized at the 1% level; VOLA_W1_{jt} = variance of total shareholder return over the last five years of firm j for fiscal year t winsorized at the 1% level; AUD_W1_{jt} = an indicator variable equal to 1 if firm j is audited by a Big4 company for fiscal year t winsorized at the 1% level, and 0 otherwise; and CRISIS_W1_t = is an indicator variable, equal to 1 if the fiscal year t is considered to be crisis year (2008), 0 otherwise (2005-2007 and 2009) winsorized at the 1% level.

⁶⁹ For the quality and scope models the association between disclosure and crisis is expected to be negative. For the relation between quantity and crisis the direction is unclear.

b) Winsorizing at 5% Level

	Exp. Sign	QUAL_W5 _{jt} (N=442)	SCOPE_W5 _{jt} (N=442)	QUAN_W5 _{jt} (N=442)
Intercept		26.817*** (2.83)	5.352 (1.25)	-797.571 (-1.62)
SIZE_W5 _{jt}	+	1.257*** (2.60)	1.080*** (4.52)	182.683*** (6.88)
CHS_W5 _{jt}	-	-0.548 (-0.15)	1.316 (0.71)	-297.659 (-1.60)
LEV_W5 _{jt}	?	-0.041 (-0.84)	-0.039 (-1.57)	3.677 (1.38)
ROE_W5 _{jt}	?	0.003 (0.05)	-0.003 (-0.11)	-12.007*** (-4.14)
VOLA_W5 _{jt}	-	-3.468** (-2.01)	-0.593 (-0.62)	180.556 (1.54)
AUD_W5 _{jt}	+	0.011 (0.01)	1.575 (1.48)	50.001 (0.49)
CRISIS_W5 _t	-/? ⁷⁰	-5.187*** (-2.95)	-1.970** (-2.13)	158.791 (1.56)
Industry fixed effects		yes	yes	yes
R ²		12.1%	16.7%	25.2%
Adj. R ²		9.2%	14.0%	22.7%

Notes. This table shows the OLS analysis for forward-looking disclosure and its determinants.

For the multivariate analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity-robust and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: QUAL_W5_{jt} = firm j's year t absolute forward-looking disclosure quality index winsorized at the 5% level; SCOPE_W5_{jt} = firm j's year t absolute forward-looking disclosure scope index winsorized at the 5% level; QUAN_W5_{jt} = firm j's year t absolute forward-looking disclosure quantity measure winsorized at the 5% level; SIZE_W5_{jt} = the log of firm j's total assets at the end of fiscal year t winsorized at the 5% level; CHS_W5_{jt} = firm j's percentage of equity owned by the insiders to all equity of the firm at the end of fiscal year t winsorized at the 5% level; LEV_W5_{jt} = firm j's total debt divided by the total assets at the end of fiscal year t winsorized at the 5% level; ROE_W5_{jt} = firm j's return on equity (net income before preferred dividends - preferred dividend requirement) / average of last year's and current year's common equity * 100) at the end of fiscal year t winsorized at the 5% level; VOLA_W5_{jt} = variance of total shareholder return over the last five years of firm j for fiscal year t winsorized at the 5% level; AUD_W5_{jt} = an indicator variable equal to 1 if firm j is audited by a Big4 company for fiscal year t winsorized at the 5% level, and 0 otherwise; and CRISIS_W5_t = is an indicator variable, equal to 1 if the fiscal year t is considered to be crisis year (2008), 0 otherwise (2005-2007 and 2009) winsorized at the 5% level.

⁷⁰ For the quality and scope models the association between disclosure and crisis is expected to be negative. For the relation between quantity and crisis the direction is unclear.

c) Fixed Effect Model

$$DISC_{jt} = \beta_0 + \beta_1 SIZE_{jt} + \beta_2 CHS_{jt} + \beta_3 LEV_{jt} + \beta_4 ROE_{jt} + \beta_5 VOLA_{jt} + \beta_6 AUD_{jt} + \beta_7 CRISIS_t + \varepsilon_{jt}$$

Variable	Model 1		Model 2		Model 3	
	QUAL _{jt} (N=442)		SCOPE _{jt} (N=442)		QUAN _{jt} (N=442)	
Intercept	12.657 (0.45)	-24.132 (-0.87)	-3.604 (-0.23)	-17.522 (-1.12)	-6550.224*** (-2.71)	-5985.035** (-2.50)
SIZE _{jt}	0.955 (0.49)	3.507* (1.83)	1.365 (1.26)	2.330** (2.15)	528.337*** (3.11)	489.131*** (2.91)
CHS _{jt}	-6.384 (-1.22)	-4.327 (-0.84)	-1.009 (-0.40)	-0.231 (-0.09)	517.854** (2.05)	486.260* (1.90)
LEV _{jt}	-0.054 (-0.57)	-0.051 (-0.57)	-0.026 (-0.49)	-0.025 (-0.49)	0.171 (0.03)	0.125 (0.02)
ROE _{jt}	0.088* (1.87)	0.089* (1.85)	0.046* (1.85)	0.046* (1.82)	-5.087** (-2.58)	-5.108** (-2.58)
VOLA _{jt}	-0.246** (-2.23)	-0.159 (-1.35)	-0.217*** (-3.27)	-0.184** (-2.54)	0.883 (0.10)	-0.460 (-0.06)
AUD _{jt}	6.037* (1.81)	5.656 (1.48)	1.027 (0.74)	0.884 (0.59)	279.099* (1.89)	284.940** (2.00)
CRISIS _t		-5.633*** (-5.08)		-2.131*** (-3.61)		86.537* (1.67)
R ²	2.9%	9.1%	2.6%	6.3%	11.8%	12.4%
Adj. R ²	1.6%	7.7%	1.3%	4.8%	10.6%	11.0%
Number of groups	98		98		98	

Notes. This table shows a fixed effects analysis for forward-looking disclosure and its determinants.

For the fixed effect analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity robust. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: QUAL_{jt} = firm j's year t absolute forward-looking disclosure quality index; SCOPE_{jt} = firm j's year t absolute forward-looking disclosure scope index; QUAN_{jt} = firm j's year t absolute forward-looking disclosure quantity measure; SIZE_{jt} = the log of firm j's total assets at the end of fiscal year t; CHS_{jt} = firm j's percentage of equity owned by the insiders to all equity of the firm at the end of fiscal year t; LEV_{jt} = firm j's total debt divided by the total assets at the end of fiscal year t; ROE_{jt} = firm j's return on equity (net income before preferred dividends - preferred dividend requirement) / average of last year's and current year's common equity * 100) at the end of fiscal year t; VOLA_{jt} = variance of total shareholder return over the last five years of firm j for fiscal year t; AUD_{jt} = an indicator variable equal to 1 if firm j is audited by a Big4 company for fiscal year t, and 0 otherwise; and CRISIS_t = is an indicator variable, equal to 1 if the fiscal year t is considered to be crisis year (2008), 0 otherwise (2005-2007 and 2009).

d) Different Specifications of the Dependent Variable Quality

Variable	Exp. Sign	Model 1 QUAL _{jt} (N = 442)	Model 2 QUAL_W2 _{jt} (N = 442)	Model 3 QUAL_CS _{jt} (N = 442)
Intercept	?	24.190*** (2.63)	25.032*** (2.63)	24.488*** (2.78)
SIZE _{jt}	+	1.509*** (3.07)	1.621*** (3.17)	1.051** (2.25)
CHS _{jt}	-	-1.068 (-0.26)	-0.564 (-0.13)	-0.217 (-0.06)
LEV _{jt}	?	-0.042 (-0.85)	-0.042 (-0.80)	-0.044 (-0.94)
ROE _{jt}	?	0.005 (0.10)	0.005 (0.09)	0.012 (0.24)
VOLA _{jt}	-	-0.849*** (-4.96)	-0.881*** (-5.02)	-0.801*** (-4.70)
AUD _{jt}	+	-1.537 (-0.50)	-2.460 (-0.72)	-1.602 (-0.54)
CRISIS _t	-/? ⁷¹	-5.610** (-2.49)	-5.761** (-2.37)	-5.640*** (-2.65)
Industry fixed effects		yes	yes	yes
R ²		9.6%	9.9%	8.5%
Adj. R ²		6.6%	6.9%	5.5%

Notes. This table shows the OLS analysis for forward-looking disclosure and its determinants.

For the multivariate analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity-robust and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: QUAL_{jt} = firm j's year t absolute forward-looking disclosure quality index; QUAL_W2_{jt} = firm j's year t absolute forward-looking disclosure quality index with a different weighting for point and bound forecasts than in the quality index; QUAL_CS_{jt} = firm j's year t absolute forward-looking disclosure quality index for quantifiable company specific forecasts; SIZE_{jt} = the log of firm j's total assets at the end of fiscal year t; CHS_{jt} = firm j's percentage of equity owned by the insiders to all equity of the firm at the end of fiscal year t; LEV_{jt} = firm j's total debt divided by the total assets at the end of fiscal year t; ROE_{jt} = firm j's return on equity (net income before preferred dividends - preferred dividend requirement) / average of last year's and current year's common equity * 100) at the end of fiscal year t; VOLA_{jt} = variance of total shareholder return over the last five years of firm j for fiscal year t; AUD_{jt} = an indicator variable equal to 1 if firm j is audited by a Big4 company for fiscal year t, and 0 otherwise; and CRISIS_t = is an indicator variable, equal to 1 if the fiscal year t is considered to be crisis year (2008), 0 otherwise (2005-2007 and 2009).

⁷¹ For the quality and scope models the association between disclosure and crisis is expected to be negative. For the relation between quantity and crisis the direction is unclear.

e) Different Specifications of the Independent Variable Crisis

	Model 1		Model 2		Model 3	
	QUAL _{it} (N=442)	QUAN _{it} (N=442)	SCOPE _{it} (N=442)	SCOPE _{it} (N=442)	QUAN _{it} (N=442)	QUAN _{it} (N=442)
Intercept	24.185*** (2.63)	25.360*** (2.76)	23.443** (2.53)	6.349 (1.53)	5.733 (1.39)	-552.619 (-1.15)
SIZE _{it}	1.509*** (3.07)	1.474*** (2.97)	1.538*** (3.12)	1.014*** (4.27)	1.035*** (4.39)	165.116*** (6.37)
CHS _{it}	-1.068 (-0.26)	-0.481 (-0.12)	-2.001 (-0.47)	1.514 (0.75)	1.027 (0.50)	-328.875* (-1.67)
LEV _{it}	-0.042 (-0.85)	-0.036 (-0.71)	-0.040 (-0.79)	-0.036 (-1.45)	-0.038 (-1.52)	4.046 (1.56)
ROE _{it}	0.005 (0.10)	-0.020 (-0.36)	0.003 (0.06)	-0.008 (-0.29)	-0.001 (-0.03)	-8.872*** (-2.88)
VOLA _{it}	-0.849*** (-4.96)	-0.907*** (-5.36)	-0.883*** (-5.34)	-0.407*** (-4.57)	-0.403*** (-4.82)	-20.19 (-1.25)
AUD _{it}	-1.537 (-0.50)	-1.471 (-0.48)	-1.335 (-0.44)	1.707 (1.36)	1.788 (1.43)	71.796 (0.61)
CRISIS _{1t}	-5.610** (-2.49)		-1.912* (-1.74)		166.686 (1.43)	
CRISIS _{2t}		-4.281** (-2.17)		-1.418 (-1.52)		375.569*** (3.90)
CRISIS _{R_t}			-3.696* (-1.69)		-1.343 (-1.32)	
Industry fixed effects	yes	yes	yes	yes	yes	yes
R ²	9.6%	9.3%	8.8%	14.9%	14.6%	22.1%
Adj. R ²	6.6%	6.3%	5.8%	12.1%	11.8%	19.6%
						22.2%
						19.4%

Notes: This table shows the OLS analysis for forward-looking disclosure and its determinants.

For the multivariate analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity-robust and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: QUAL_{it} = firm j's year t absolute forward-looking disclosure quality index; SCOPE_{it} = firm j's year t absolute forward-looking disclosure scope index; QUAN_{it} = firm j's year t absolute forward-looking disclosure quantity measure; SIZE_{it} = the log of firm j's total assets at the end of fiscal year t; CHS_{it} = firm j's percentage of equity owned by the insiders to all equity of the firm at the end of fiscal year t; LEV_{it} = firm j's total debt divided by the total assets at the end of fiscal year t; ROE_{it} = firm j's return on equity (net income before preferred dividends - preferred dividend requirement) / average of last year's and current year's common equity * 100) at the end of fiscal year t; VOLA_{it} = variance of total shareholder return over the last five years of firm j for fiscal year t; AUD_{it} = an indicator variable equal to 1 if firm j is audited by a Big4 company for fiscal year t, and 0 otherwise; CRISIS_{1t} = an indicator variable, equal to 1 if the fiscal year t is considered to be crisis year (2008), 0 otherwise (2005-2007 and 2009); CRISIS_{2t} = an indicator variable, equal to 1 if the fiscal year t is considered to be crisis year (2008 and 2009), 0 otherwise (2005-2007); and CRISIS_{R_t} = an indicator variable equal to 1 if revenue from one to the next year decreases, 0 otherwise.

Appendix 5: Example: Decrease in Disclosure Quality

In the following to table I show the example of a decrease in quality of one company across years. The level of quality for each firm is categorized in quintiles/deciles each year. The second column in the tables shows the respective quintile/decile of each year.

Decrease of 2 Quintiles			
Year	Quintile	Explanation	Disc_dummy_ch_GB_D2
2005	3		.
2006	1	-2 quintiles	1
2007	1	Stable	0
2008	1	Stable	0
2009	1	Stable	0

Decrease of 4 Deciles			
Year	Decile	Explanation	Disc_dummy_ch_GB_D4
2005	5		.
2006	2	-3 deciles	0
2007	2	Stable	0
2008	2	Stable	0
2009	1	-1 decile	0

Notes. Disc_dummy_ch_GB_D2 = 1 if firm decreased quality more than 2 deciles and 0 if the change is ≤ 0 or > -2 deciles and Disc_dummy_ch_GB_D4 = 1 if firm decreased quality more than 4 deciles and 0 if the change is ≤ 0 or > -4 deciles.

Appendix 6: Increase in Disclosure Quality

a) Percentage Increase

	Expected Sign	Model 1 +30% (N = 202)	Model 2 +50% (N = 202)	Model 3 +70% (N = 202)
Intercept	?	-2.520*** (-5.25)	-2.478*** (-5.20)	-2.478*** (-5.13)
logMV _{jt}	-	-0.480*** (-20.53)	-0.481*** (-20.72)	-0.482*** (-20.43)
logPRICE _{jt}	-	-0.315*** (-4.29)	-0.326*** (-4.43)	-0.323*** (-4.36)
logTURN _{jt}	-	-0.380*** (-7.96)	-0.380*** (-7.82)	-0.380*** (-7.81)
logRET _{jt}	+	0.265*** (4.04)	0.274*** (4.18)	0.269*** (4.06)
logFF _{jt}	-	0.020 (0.21)	0.009 (0.09)	0.020 (0.21)
qual_pro_ch_BG3	-	-0.154** (-2.29)		
qual_pro_ch_BG5	-		-0.189*** (-2.67)	
qual_pro_ch_BG7	-			-0.107 (-1.36)
Industry fixed effects		yes	yes	yes
R ²		83.7%	83.9%	83.4%
Adj. R ²		82.5%	82.7%	82.3%

Notes. This table shows the OLS analysis for bid-ask spreads and forward-looking disclosure quality.

For the multivariate analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity-robust and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: logMV_{jt} = the log of firm j's year t market value at the end of the fourth month following the year-end; logPRICE_{jt} = the log of firm j's year t stock price at the end of the fourth month following the year-end; logTURN_{jt} = the log of firm j's year t daily turnover, averaged over the fourth months following the year-end; logRET_{jt} = the log of firm j's year t standard deviation of stock returns over the fourth months following the year-end; logFF_{jt} = the log of firm j's year t free float at the end of the fourth months following the year-end; and qual_pro_ch_BG3 (5) (7) = 1 if firm improved quality more than 30%, 50%, 70% respectively and 0 if the change is ≥ 0 or $< 30\%$, 50% , 70% respectively.

b) Increase in Deciles

	Expected Sign	Model 1 +2 (N = 229)	Model 2 +3 (N = 229)	Model 3 +4 (N = 229)
Intercept	?	-2.808*** (-7.29)	-2.847*** (-7.34)	-2.852*** (-7.30)
logMV _{jt}	-	-0.491*** (-20.63)	-0.489*** (-20.63)	-0.488*** (-19.93)
logPRICE _{jt}	-	-0.255*** (-3.93)	-0.254*** (-3.86)	-0.254*** (-3.79)
logTURN _{jt}	-	-0.363*** (-7.38)	-0.366*** (-7.42)	-0.363*** (-7.40)
logRET _{jt}	+	0.243*** (4.10)	0.242*** (3.98)	0.243*** (3.96)
logFF _{jt}	-	-0.075 (-0.82)	-0.076 (-0.83)	-0.087 (-0.94)
disc_dummy_ch_BG_D2	-	-0.140** (-2.17)		
disc_dummy_ch_BG_D3	-		-0.139* (-1.85)	
disc_dummy_ch_BG_D4	-			-0.128 (-1.14)
Industry fixed effects		yes	yes	yes
R ²		84.4%	84.3%	84.2%
Adj. R ²		83.5%	83.4%	83.2%

Notes. This table shows the OLS analysis for bid-ask spreads and forward-looking disclosure quality.

For the multivariate analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity-robust and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: logMV_{jt} = the log of firm j's year t market value at the end of the fourth month following the year-end; logPRICE_{jt} = the log of firm j's year t stock price at the end of the fourth month following the year-end; logTURN_{jt} = the log of firm j's year t daily turnover, averaged over the fourth months following the year-end; logRET_{jt} = the log of firm j's year t standard deviation of stock returns over the fourth months following the year-end; logFF_{jt} = the log of firm j's year t free float at the end of the fourth months following the year-end; and disc_dummy_ch_BG_D2 (3) (4) = 1 if firm improved quality more than 2, 3, 4 deciles respectively and 0 if the change is ≥ 0 or $< 2, 3, 4$ deciles respectively.

c) Increase in Quintiles

	Expected Sign	Model 1 +1 (N = 254)	Model 2 +2 (N = 254)	Model 3 +3 (N = 254)
Intercept	?	-2.971*** (-7.87)	-2.990*** (-7.86)	-3.018*** (-7.83)
logMV _{jt}	-	-0.500*** (-20.53)	-0.498*** (-20.36)	-0.499*** (-19.99)
logPRICE _{jt}	-	-0.188*** (-2.99)	-0.187*** (-2.97)	-0.188*** (-2.95)
logTURN _{jt}	-	-0.357*** (-7.72)	-0.356*** (-7.73)	-0.364*** (-7.78)
logRET _{jt}	+	0.200*** (3.61)	0.202*** (3.59)	0.203*** (3.61)
logFF _{jt}	-	-0.095 (-1.07)	-0.095 (-1.06)	-0.086 (-0.95)
disc_dummy_ch_BG1	-	-0.124** (-2.03)		
disc_dummy_ch_BG2	-		-0.182** (-2.05)	
disc_dummy_ch_BG3	-			-0.069 (-0.45)
Industry fixed effects		yes	yes	yes
R ²		84.0%	84.0%	83.7%
Adj. R ²		83.1%	83.1%	82.8%

Notes. This table shows the OLS analysis for bid-ask spreads and forward-looking disclosure quality.

For the multivariate analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity-robust and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: logMV_{jt} = the log of firm j's year t market value at the end of the fourth month following the year-end; logPRICE_{jt} = the log of firm j's year t stock price at the end of the fourth month following the year-end; logTURN_{jt} = the log of firm j's year t daily turnover, averaged over the fourth months following the year-end; logRET_{jt} = the log of firm j's year t standard deviation of stock returns over the fourth months following the year-end; logFF_{jt} = the log of firm j's year t free float at the end of the fourth months following the year-end; and disc_dummy_ch_BG_1 (2) (3) = 1 if firm improved quality more than 1, 2, 3 quintiles respectively and 0 if the change is ≥ 0 or $< 1, 2, 3$ quintiles respectively.

Appendix 7: Decrease in Disclosure Quality

a) Percentage Decrease

	Expected Sign	Model 1 -30% (N = 184)	Model 2 -50% (N = 184)	Model 3 -70% (N = 184)
Intercept	?	-3.316*** (-6.04)	-3.346*** (-6.14)	-3.347*** (-6.52)
logMV _{jt}	-	-0.501*** (-16.28)	-0.503*** (-16.29)	-0.501*** (-16.53)
logPRICE _{jt}	-	-0.146** (-2.40)	-0.140** (-2.31)	-0.141** (-2.34)
logTURN _{jt}	-	-0.374*** (-5.82)	-0.375*** (-5.95)	-0.377*** (-6.41)
logRET _{jt}	+	0.134** (2.40)	0.132** (2.36)	0.134** (2.40)
logFF _{jt}	-	-0.188 (-1.64)	-0.185 (-1.64)	-0.169 (-1.61)
qual_pro_ch_GB3	+	0.020 (0.27)		
qual_pro_ch_GB5	+		0.073 (0.86)	
qual_pro_ch_GB7	+			0.212 (1.38)
Industry fixed effects		yes	yes	yes
R ²		84.9%	85.0%	85.1%
Adj. R ²		83.8%	83.8%	84.0%

Notes. This table shows the OLS analysis for bid-ask spreads and forward-looking disclosure quality.

For the multivariate analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity-robust and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: logMV_{jt} = the log of firm j's year t market value at the end of the fourth month following the year-end; logPRICE_{jt} = the log of firm j's year t stock price at the end of the fourth month following the year-end; logTURN_{jt} = the log of firm j's year t daily turnover, averaged over the fourth months following the year-end; logRET_{jt} = the log of firm j's year t standard deviation of stock returns over the fourth months following the year-end; logFF_{jt} = the log of firm j's year t free float at the end of the fourth months following the year-end; and qual_pro_ch_GB3 (5) (7) = 1 if firm decreased quality more than 30%, 50%, 70% respectively and 0 if the change is ≤ 0 or > -30%, -50%, -70% respectively.

b) Decrease in Deciles

	Expected Sign	Model 1 -2 (N = 206)	Model 2 -3 (N = 206)	Model 3 -4 (N = 206)
Intercept	?	-3.059*** (-5.95)	-3.118*** (-6.14)	-3.110*** (-6.04)
logMV _{jt}	-	-0.512*** (-16.91)	-0.513*** (-16.81)	-0.512*** (-16.88)
logPRICE _{jt}	-	-0.164*** (-2.60)	-0.152** (-2.45)	-0.155** (-2.42)
logTURN _{jt}	-	-0.377*** (-6.08)	-0.378*** (-6.14)	-0.378*** (-6.16)
logRET _{jt}	+	0.158*** (3.00)	0.151*** (2.90)	0.152*** (2.90)
logFF _{jt}	-	-0.128 (-1.21)	-0.121 (-1.16)	-0.122 (-1.16)
disc_dummy_ch_GB_D2	+	-0.061 (-0.90)		
disc_dummy_ch_GB_D3	+		0.008 (0.11)	
disc_dummy_ch_GB_D4	+			-0.021 (-0.22)
Industry fixed effects		yes	yes	yes
R ²		86.0%	86.0%	86.0%
Adj. R ²		85.1%	85.0%	85.0%

Notes. This table shows the OLS analysis for bid-ask spreads and forward-looking disclosure quality.

For the multivariate analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity-robust and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: logMV_{jt} = the log of firm j's year t market value at the end of the fourth month following the year-end; logPRICE_{jt} = the log of firm j's year t stock price at the end of the fourth month following the year-end; logTURN_{jt} = the log of firm j's year t daily turnover, averaged over the fourth months following the year-end; logRET_{jt} = the log of firm j's year t standard deviation of stock returns over the fourth months following the year-end; logFF_{jt} = the log of firm j's year t free float at the end of the fourth months following the year-end; and disc_dummy_ch_GB_D2 (3) (4) = 1 if firm decreased quality more than 2, 3, 4 deciles respectively and 0 if the change is ≤ 0 or > -2, -3, -4 deciles respectively.

c) Decrease in Quintiles

	Expected Sign	Model 1 -1 (N = 235)	Model 2 -2 (N = 235)	Model 3 -3 (N = 235)
Intercept	?	-2.895*** (-6.56)	-2.937*** (-6.62)	-2.936*** (-6.68)
logMV _{jt}	-	-0.504*** (-17.85)	-0.504*** (-17.78)	-0.504*** (-17.68)
logPRICE _{jt}	-	-0.180*** (-2.87)	-0.171*** (-2.76)	-0.169*** (-2.74)
logTURN _{jt}	-	-0.337*** (-6.38)	-0.338*** (-6.47)	-0.337*** (-6.42)
logRET _{jt}	+	0.171*** (3.20)	0.165*** (3.10)	0.163*** (3.05)
logFF _{jt}	-	-0.215** (-2.22)	-0.209** (-2.18)	-0.214** (-2.19)
disc_dummy_ch_GB1	+	-0.070 (-1.05)		
disc_dummy_ch_GB2	+		-0.060 (-0.73)	
disc_dummy_ch_GB3	+			-0.139 (-0.92)
Industry fixed effects		yes	yes	yes
R ²		84.0%	84.0%	84.0%
Adj. R ²		83.1%	83.0%	83.0%

Notes. This table shows the OLS analysis for bid-ask spreads and forward-looking disclosure quality.

For the multivariate analysis, the coefficients are shown with their t-statistics in parentheses. The standard errors are heteroskedasticity-robust and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

I define the variables as follows: logMV_{jt} = the log of firm j's year t market value at the end of the fourth month following the year-end; logPRICE_{jt} = the log of firm j's year t stock price at the end of the fourth month following the year-end; logTURN_{jt} = the log of firm j's year t daily turnover, averaged over the fourth months following the year-end; logRET_{jt} = the log of firm j's year t standard deviation of stock returns over the fourth months following the year-end; logFF_{jt} = the log of firm j's year t free float at the end of the fourth months following the year-end and disc_dummy_ch_GB_1 (2) (3) = 1 if firm decreased quality more than 1, 2, 3 quintiles respectively and 0 if the change is ≤ 0 or > -1, -2, -3 quintiles respectively.

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