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QUANTITATIVE SUSTAINABILITY DISCLOSURE

AN INTERNATIONAL COMPARISON AND ITS IMPACT ON INVESTOR VALUATION

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Abstract

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This research focuses on the link between quantitative sustainability disclosure and information asymmetry. It builds upon previous research which links information asymmetry with voluntary disclosure. Stakeholders from the financial services sector claim that sustainability disclosure needs to be more numerical and comparable between companies. This research covers 111 firms from Denmark, Finland, the Netherlands and Sweden from non-service industries and studies how quantitative their sustainability disclosure is, and whether or not there is a negative relation with information asymmetry. The results support the hypotheses, where two out of three information asymmetry proxies have a significant negative relation with quantitative disclosure. Size is supported as a moderating factor. Quantitativity also proves to have a significant link with third party sustainability ratings. The direct link between quantitativity and cost of capital is not however supported.

Аннотация

Автор:	Мюллер, Себастьян
Тема:	Количественное раскрытие устойчивости: международные сравнения и влияние на аренду
Факультет:	ЛТУ, Школа Бизнеса
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Магистерская диссертация	Лаппеенрантаский Технологический Университет – Школа Бизнеса, Санкт-Петербургский Государственный Университет – Высшая Вкола Менеджмента. 79 страницы, 8 рисунков, 26 таблиц, 5 формул и 5 приложения
Научные руководители:	Кайсу Пуумалаийнен, профессор, Татьяна Гаранина, профессор
Ключевые слова	Устойчивость, добровольное раскрытие информации, ESG, информационная асимметрия

Данное исследование фокусирует свое внимание на связи между количественным раскрытием устойчивости и информационной асимметрией. Оно строится на предыдущем исследовании, которое связывает асимметрию с добровольным раскрытием информации. Заинтересованные стороны сектора финансовых услуг утверждают, что раскрытию устойчивости необходимо стать более нумерическим и сопоставимым между компаниями. Данное исследование изучает 111 фирм сферы нематериального производства из Дании, Финляндии, Нидерландов и Швеции и рассматривает насколько количественной является их раскрытие устойчивости, и связаны ли это с информационной асимметрией. Полученные результаты доказывают гипотезу, в которой 2 из 3 переменных информационной асимметрии имеют значительное негативное отношение к количественному раскрытию. Размер определен в качестбе модеративного фактора. Количественность также свидетельствует о наличии значительной связи с независимыми рейтингами устойчивости. Прямая связь между колличественностью и стоимостью, однако, не была подтверждена.

Table of Contents

List of Figures

List of Tables

List of Equations

1. INTRODUCTION

Sustainability is a direct driver of value creation; it is linked to process control, innovation, (avoidance of) liability and goodwill (Slater & Gilbert, 2004). Statements like these are popular yet controversial and hundreds of studies have been done to test it. Companies operating in a sustainable manner are often stated as standing out and being ahead of the game. An indicator of this is e.g. that the majority of the World Business Council for Sustainable Development members were found to be resilient to the 2008/2009 financial crisis (WBCSD, 2010). Investors are starting to see the value in sustainable companies; for this to be found, companies should disclose information in an understandable manner. Whereas the 20th century was focused on corporate protection, the 21st is more about disclosure and transparency. The current methods of disclosure are however not always practical for all stakeholders. In general, investors speak a different language than sustainability experts. Where the investors prefer financial figures, sustainability reporting is still often a report with qualitative information and narrative text (WBCSD & UNEP FI, 2010). Quantitative disclosure on sustainability, also called sustainability performance is an emerging concept within sustainability reporting; it is already fully adopted by a selected few but many companies are slacking.

Studies held by PriceWaterhouseCoopers in 2002 and Accenture in 2010 show an increase from 70 to 93% of CEO's agreeing with the statement that sustainability is vital for the company's success (Simms, 2002; Accenture, 2010). Investor uncertainty is something that is holding back companies to fully integrate sustainability into their strategy (Accenture, 2010). The non inclusion of factor performance on sustainability in valuation models therefore neglects the possible benefits; the uncertainty of both is holding back integration into the business world.

When talking about sustainability it is important to know the scope; the UN Global Compact focuses on ten principles, divided into four categories:

Human Rights, Labor Standards, Environment and Anti-Corruption (UN Global Compact, 2010). The Global Reporting Initiative has a similar structure encompassing a vast amount of issues into its reporting framework (GRI, 2008). Within this thesis the focus will be on the broader definition: ESG – Environment, Social and Governance factors, hereafter referred to as *sustainability*. A recent article stated *"There is an emerging connection between adopting sustainability and green practices and successful, long-term economic growth"* (Cokins, 2009). A sustainable company is seeking for long-term benefit for both its share- and stakeholders, in contrast to the short-term benefit demanded by shareholders during the major part of the 20th century.

Where IT and the internet was a megatrend at the end of the previous century, sustainability is the emerging megatrend of the 21st (Lubin & Esty, 2010). As with all previous megatrends, the business environment is highly influenced. Industries, financial markets, research institutions, governments and other organizations all have a say in standards, procedures, values and targets. To inform the public and each other on how this proceeds, disclosure and reporting exists. It can be seen as an addition to the 'actual work' being done, but beyond that as a way of presenting the achievements, and 'increasing the blinds' as the better doing of one firm gives incentive for its competitor to become equally sustainable.

The way these companies report thus becomes relevant, as there are no mandatory standards yet it is up to the business environment to evaluate these means of disclosure. Around two decades after the first ESG report has been released, best practices and innovative approaches have started to emerge. Disclosure can focus on the content and the way it is presented, some firms experiment by only disclosing through their websites, or through XBRL, a computer coding method where the disclosure can be read through specific software tools. Some firms innovate by covering a large amount of topics, others by providing different reports for different stakeholders.

One of the more widely spread methods within disclosure is the focus on quantitative data and key performance indicators that can be compared to previous years, competitors and future goals of the company. Although data like this is disclosed by most firms, the extent to which this is done varies significantly. This research focuses on these aspects of quantitative disclosure and how they relate to the way the financial markets evaluate them. The managerial relevance of the topic is therefore clear, as you focus on environment, society, and on how your firm is governed. Does quantitative disclosure prove to be more useful for investors when talking about sustainability?

1.1. Research Problem

The link between sustainability performance and financial performance has been studied on many occasions with varying results, where none of the studies show a significantly positive or negative relation between the two (Margolis, Elfenbein, & Walsh, 2007). Regarding reporting/disclosure, studies have been performed to test voluntary disclosure (Petersen & Plenborg, 2006; Cheng, Courtenay, & Krishnamurti, 2006), the impact of XBRL (Yoon, Zo, & Ciganek, 2011), and web based performance disclosure (Aerts, Cormier, & Magnan, 2007) on investor valuation and information asymmetry. Cormier et al. (2009) showed that quantitative human and social disclosure had more impact on information asymmetry than qualitative disclosure of those topics. Links have thus been proven between voluntary/non financial disclosure and information asymmetry, between quantitative human/social disclosure and information asymmetry but to my best knowledge *not* between quantitative sustainability disclosure and information asymmetry.

The goal of this research is to prove that the quantitative aspect of sustainability disclosure is important for investors, and to test specific factors involved. Specific factors entail elements of reporting that increase the usefulness for investors, such as whether or not the sustainability disclosure is integrated into one annual report, whether it clarifies the materiality

(relevancy) of the disclosure, if assurance is provided and whether or not the environmental/social accounting system is explained or not. This will be done by analyzing the content of sustainability reports, and linking these with different investor valuation aspects of the respective companies.

1.2 Objectives and delimitations

With the goal of proving the benefit of quantitative sustainability disclosure, the objectives are *one* to link the figure of quantitativity to information asymmetry, *two* to link quantitativity to market valuation, *three* to link quantitativity to sustainability ratings and *four* to test if a link to sustainability is still found when focusing on general sustainability disclosure scores rather than specifically looking at the quantitative element. The boundary of the study will be geographic: covering the Nordic EU countries plus the Netherlands, industrial: only energy intensive firms such as energy, manufacturing and transport, turnover: at least 50 million Euros in revenue and to test for investor valuation the case firms must be listed on a public stock exchange. Due to the time intensive research methodology of content analysis, a longitudinal study was not feasible for a large sample therefore the focus was on reports released in 2010, covering either the year 2009, book year 2008/2009 and in one case book year 2009/2010.

2. LITERATURE REVIEW

Sustainability reporting as a research topic has gained popularity during the last ten years a search for the term "sustainability reporting" on EBSCO gives you 33 results from before 2001. Limited to 2001 to 2005 the same search query gives you 212 results which more than doubles to 471 if you search for articles released between 2006 and 2010 (EBSCO, 2010). A large amount of research conducted is done by consulting firms, non-profit organizations or a collaboration of the two. With the majority focusing on the general implementation of sustainable practices in businesses; many include a section on sustainability reporting. Academic research is also present,

focusing on the more narrow aspects of sustainability, less descriptive than the former.

Figure 1 below shows the major streams of literature relevant for the research, the outer spectrums of 'Sustainability Strategy' and 'Mainstream Investment' are studied more by institutions, organizations and consulting firms. More central but still not covered in this study is the link between Corporate Sustainability Performance and Corporate Financial Performance. Most relevant are the studies that focus on types of corporate disclosure and its link with information asymmetry.

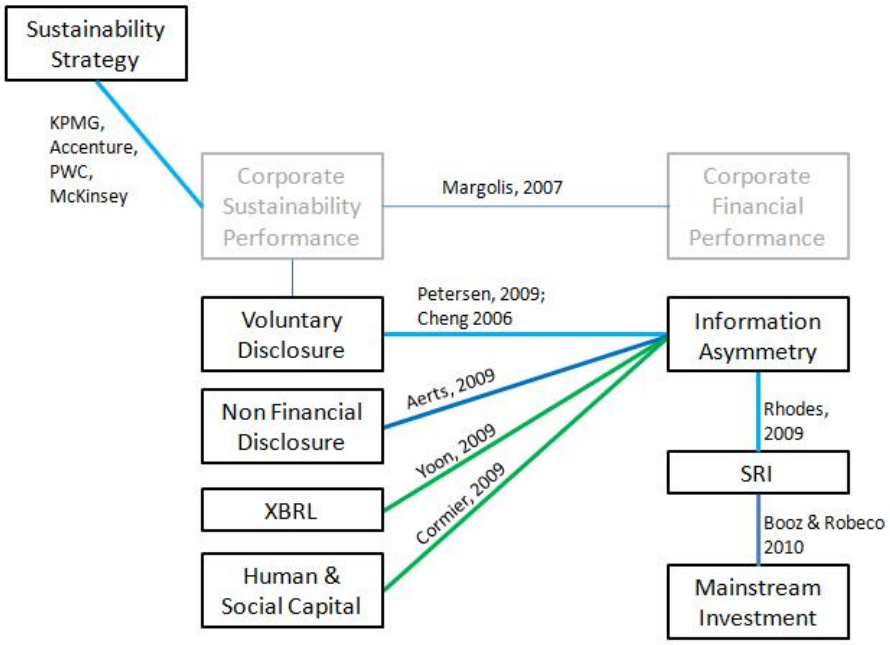

Figure 1: Major literature streams

The UN Global Compact, which describes itself as a "strategic policy initiative for businesses", partners up with a consulting firm every three years to carry out a questionnaire on sustainability for the CEOs of its member companies (UN Global Compact, 2010). This first 'participant mirror' was released by McKinsey & Company in 2007; with the goal to analyze the current state of sustainability (McKinsey & Company, 2007). The second was released in 2010 by Accenture, using the same research structure the two reports can thus be compared and analyzed. The result shows that in the last three years, sustainability has moved from being present in company strategies to

becoming a core part of the business (Accenture, 2010). With 93% of the CEOs stating that *"sustainability issues will be critical to the future success of their business"*.

PriceWaterhouseCoopers released a similar report in 2002, which was a survey of 140 US based companies with >100 million US dollars in revenue. The section covering sustainability reporting showed that in 2002, 32% of the respondents issued a report, 41% were planning to do so in the future and 26% had no plans whatsoever to publish a sustainability report (PriceWaterhouseCoopers, 2002). This indicates a shift that has occurred during the last decade.

The next sections will cover the most important conclusions from the literature which have been used as input for the research. The two main fronts of the hypotheses are those of sustainability disclosure, and that of investor valuation. After this the associated factors of integrated reporting, materiality, assurance and sustainability accounting will be covered.

3. SUSTAINABILITY & DISCLOSURE

The demand for sustainability reporting has largely been created by the market. Governments, organizations and institutions have set up laws and programs that give companies the incentive to disclose their operations and practices regarding sustainability. The starting point of this research has been to fully understand the standards and concepts surrounding the topic. Sustainability disclosure is broad, many different aspects and factors can be considered. Sustainable and Responsible Investment (SRI) is an equally important aspect of this topic. Several key concepts, standards and organizations will therefore be introduced to further clarify.

3.1 Standards and Guidelines

One of the most complete and up-to-date overviews of ESG reporting, both voluntary and mandatory is the 2010 KPMG report called: *"Carrots and Sticks – Promoting Transparency and Sustainability"*. Social reporting has

been present since the 1960s, in the 1990s it became popular internationally, with the launch of GRI, Global Reporting Initiative in 1997 (KPMG, 2010). This section will cover a basic introduction to different global reporting standards, collectives focusing on reporting and SRI and the difference between voluntary and mandatory reporting. The vast amount of regional and industrial reporting standards will not be covered, if the reader wishes to learn more about these I recommend to read the Carrots and Sticks report which can be found on www.kpmg.com.

3.1.1 Voluntary & Mandatory Reporting

In the 30 countries covered by the Carrots and Sticks report, around 65% of the guidelines are mandatory and 35% voluntary (KPMG, 2010). It is obvious that the voluntary reporting guidelines go further than their mandatory counterparts. However the reports published to the public by businesses are all voluntary. Mandatory reporting is demanded by local or national governments which need to be aware of different environmental and social factors. For example, in the Netherlands the government demands companies owning landfills to disclose their methane emissions, which have to be calculated using a certain method (VROM, 2010). The information disclosed to investors is therefore all of voluntary kind, the most common one is created by Global Reporting Initiative. For this information to be relevant, the most essential criteria to relate the ESG data to professionals, is that they are well documented and quantified – done best in the form of KPIs (EFFAS, DVGA, 2010).

3.1.2 Global Reporting Initiative (GRI)

GRI is a network based organization that provides the most extensive sustainability reporting standards available at this moment in time. It is based in Amsterdam, the Netherlands and in 2009 almost 1400 reports based on the G3 guidelines were issued (GRI, 2010). Released in 2006, the G3 guidelines are the most recent update by GRI. The first part includes principles on content & quality and guidance on setting the boundary – which operations the company should report on (GRI, 2010). The second part has

the standards, what exactly should be included regarding strategy, management approach and indicators. GRI provides guidelines on so called "Application Levels", ranging from C to A+ they show to what extent a company is reporting. C level is the basic entry grade, the company only has to report some aspect and disclose 10 core indicators. A+ level requires the company to disclose on all 50 core indicators; the + indicates that the report is externally verified. By 2008, 77% of the G250 had already adopted GRI guidelines to some extent; of these 48% were A or A+, 43% B or B+ and 11% C or C+ (KPMG, 2008). The higher the application levels get, the higher is the proportion of externally verified reports.

3.1.3 UN Global Compact

"The UN Global Compact is a strategic policy initiative for businesses that are committed to aligning their operations and strategies with ten universally accepted principles in the areas of human rights, labor, environment and anti-corruption" (UN Global Compact, 2010). With more than 8000 members of whom 5300 are businesses, it is currently the largest collective of sustainability oriented companies. They use the Global Compact for guidelines, best practices, engagement activities but also as a reference to show that the company is being sustainable. Critics mention *blue-washing'* as a reason to become a member, meaning that companies use the Global Compact logo to show they are being sustainable where in fact they are not (Arevalo, 2010) . The Global Compact website denies this by stating that companies are restricted in doing so, furthermore they actively delist companies failing to communicate on progress (UN Global Compact, 2010). Overall the initiative does not have any significant requirements; its aim is more to convey members to act sustainable.

3.1.4 Environmental Reporting Guidelines

Together with labor conditions, climate change makes one of the most relevant topics in sustainability reporting. Organizations like the World Business Council for Sustainable Development (WBCSD), World Resource Institute (WRI), GDF Suez and the International Standards Organization (ISO)

have all created methods to calculate a firm's environmental impacts. The Carbon Disclosure Project (CDP) sends an annual questionnaire to its members regarding their environmental disclosure. With this data they give ratings with the aim to motivate businesses, investors and governments to take action against climate change (KPMG, 2010).

3.1.5 Assurance Guidelines

As with financial reporting, there is the demand for assurance regarding the sustainability of companies. Three main types of assurance can be defined, accounting firms (big-4), certification bodies (e.g. ISO) and sustainability consultants (Perego, 2009). AccountAbility offers the AA1000 Assurance Standard, which *"provides a methodology for assurance practitioners to evaluate the nature and extent to which an organization adheres to the AccountAbility Principles"* (AccountAbility, 2010). The International Federation of Accountants (IFAC) released a broader standard called the ISAE3000, covering all non-financial data, including sustainability (IFAC, 2010). These two standards are complementary, an example is the 2009 Volkswagen AG report verified by PriceWaterhouseCoopers which mentions both standards in the assurance report (Volkswagen AG, 2009)

3.2 Current Status of Sustainability Reporting

Since 1993, KPMG has released six studies on sustainability reports published by the large businesses (KPMG, 2008). The most recent study included the global fortune 250 (G250) and the 100 largest companies of 22 countries (N100) thus encompassing the majority of the world's leading firms. Key findings are that in countries such as the United Kingdom and Japan, sustainability reporting as we know it today is "nearing saturation". Other countries like the United States and Spain are showing heavy increases in number of companies reporting, where sustainability reporting in eastern European countries is just an emerging topic. One of the main findings of the 2008 report are that the drivers for reporting are moving from risk management to ethical consideration and innovation – more consumer based drivers. Value is being incorporated more into the report, showing the

business value behind the corporate responsibility and assurance is becoming more common.

This extensive study conducted every three years is able to monitor the trends behind reporting and the progress companies are making. Something that is becoming more relevant is the integration of reporting; integrated reporting is where ESG factors and financial figures are combined into one annual report. The KPMG study of 2008 showed an increase in (limited) integration; the report states that *"this reflects the growing interest and demand for sustainability data from analysts, investors and company leadership."*

In a study by the EcoStrategy Group in 2010, several advantages of sustainability reporting are mentioned (Janowski & Gilligan, 2010). Besides creating knowledge about company operations, they also indicate the importance for the shareholders.

- Preparing for the future regulatory environment framework
- Organization's risk and opportunity assessment due to climate change
- Meeting investor's expectation
- Enhancing shareholder's value
- Data for non financial reporting
- Cost saving through elimination of wastes and efficiency improvement
- Platform for identification of CDM projects
- Company's brand equity enhancement

Nowadays, the majority of publicly traded companies is reporting on sustainability, yet investors are not impressed. There is a lack of communication between the investors and people responsible for sustainability within the companies (WBCSD & UNEP FI, 2010). In 5 discussion sessions held by the WBCSD and UNEP Finance Initiative in 2008 analysts and sustainability experts came together to define how to move forward. Key issues indicated were the different languages spoken by the two parties. Investors need numbers and key performance indicators (KPIs) whereas the reports often still only cover qualitative aspects. What investors need is a link between sustainability performance and financial performance,

at this moment in time the explicit link has not yet been found (Niskala & Schadéwitz, 2009).

3.3 Sustainability performance vs. Financial performance

Empirical research has not yet proven that sustainable investment strategies give higher returns than more traditional investing (Vermeir & Corten, 2001); neither has the correlation between sustainability reporting and return on stock. Different meta analyses have been held to see if there is a direct correlation between corporate sustainability performance (CSP) and corporate financial performance (CFP), the results are often non-conclusive (Derwall, Koedijk, & Ter Horsta, 2010). In a study covering 167 reports, a mildly positive link is found between the two aspects of performance (Margolis, Elfenbein, & Walsh, 2007). Thus no insights are to be found when looking at financial performance.

3.4 Quantitative Sustainability Disclosure

Quantitative Sustainability Disclosure (QSD) is defined on two main fronts, the quantitativity of the disclosure and the relation to sustainability. Cormier et al. (2009) describe monetary or quantitative disclosure as non-indicatory or descriptive; being comparable through time or in space. Furthermore being hard to mimic by competitors (unlike qualitative statements), giving higher credibility with the risk of damaging their competitive position by disclosing too much proprietary information. In one of the founding studies on voluntary disclosure, Botonan (1997) Quantitative information data was weighed more heavily. She states that as it contains precise information, is more useful and that it may enhance the firm's reporting reputation and credibility.

The GRI G3 guidelines include 22 different KPIs companies can use to show their sustainability performance, including simple factors like water and power consumption but also the scope 3 emissions of a company's supply chain which is less easy to define (GRI, 2008). The UNEP FI & WBCSD discussions resulted in a list of 12 examples of environmental, social and

governance KPIs, which would be beneficial for investors when valuating companies. The report concludes that *"companies should integrate financial matters into decision making operations and disclosure and communicate this to investors."* Investors should integrate ESG data into their valuation methods and build knowledge on the subject. To make these sets of data more valuable and comparable, companies should make sector-wide standards on how to disclose, and communicate directly to investors in one-on-one dialogues (WBCSD & UNEP FI, 2010).

Different research have shown that quantitative sustainability disclosure is both demanded directly from the market and proven to be a more effective method than qualitative disclosure (Aerts et al. 2007, Cormier et al. 2009, SustainAbility 2011). The latter, together with KPMG and Futerra (a sustainability communications consultancy firm) released a survey with >5000 respondents of reporters and readers of these reports. One of their main conclusions was the importance of performance data; 70% of the investors chose this as the most important factor of the reports. In addition to this, they found that there is a clear difference in importance of performance data between countries, where Brazilians prefer robust data, Americans like to see 'visible actions of a company' as proof for future success, and Indians see performance data as relatively unimportant altogether. Furthermore, half of the respondents have used sustainability reports in the decision making process of investments (SustainAbility, KMPG, Futerra, 2011).

Many companies however, still have difficulties to effectively disclose sustainability performance to investors. In a report released by the GRI in 2009, they indicate that investors, among others, need the ESG strategy linked to overall strategy & performance which is related to current activities (GRI, 2009). Three parts of the report would then add to the value; by including a CEO statement on sustainability, an analysis of risks and opportunities and performance data, the investor would be able to integrate, screen and engage with the company. Comparability is an issue for investors when looking at non-financial information, as they are often unfamiliar with

the concepts and the fact that different firms disclose different things (Orens & Lybaert, 2010; Maines, et al., 2002). For performance data to be relevant, it needs to be comparable between similar firms, across time and within context (McElroy, 2009). The latter is defined by having a common denominator, so that companies become truly comparable.

However, before a common denominator can be defined the company needs to have the information disclosed as a quantitative metric. Providing quantitative disclosure has been proved to decrease stock volatility (Aerts, Cormier, & Magnan, 2007). They state that for financial analysts, quantitative data is easier to use in rating firms and that it conveys more new information than qualitative data. Another indicator of information quality/symmetry is the dispersion between analysts. A study in 2003 showed that *"voluntary disclosure of forward looking nonfinancial information is significantly associated with lower levels of dispersion and higher levels of accuracy in analysts' earnings forecasts* (Vanstraelen, Zarzeski, & Robb, 2009)*"*. Non-Financial is however not always sustainability disclosure; a company describing its new LEAN approach for example is not a financial disclosure, but it is not sustainability either.

Oren & Lybaert (2010) follow the Financial Accounting Standards Board (FASB) description of nonfinancial disclosures: index scores, ratios, counts and other information not presented in the basic financial statements. According to the International Accounting Standards Board (IASB), the financial statements are generally composed out of five main documents (Deloitte, 2011).

- a statement of financial position (balance sheet) at the end of the period
- a statement of comprehensive income for the period
- a statement of changes in equity for the period
- a statement of cash flows for the period
- notes, comprising a summary of accounting policies and other explanatory notes

Thus any information that according to the IABS does not need to be incorporated in the above stated can be called non-financial disclosure.

As stated previously, sustainability stands for Environmental, Social and Governance. Sustainability disclosure would thus entail the reporting of those three topics. Environmental and Social are fairly clear, they both fit into the picture of "making the world a better place for everyone". Governance however seems to be more related to the management of a firm than its sustainability. In a study in 2007 by the ECCE on the use of extra-financial (non-financial) information, researchers asked investors and analysts on the relative importance of ESG factors within five categories: corporate governance, employment practices, human rights, community involvement and environmental responsibility. Here the latter makes E, the first G and the middle three stand for S in ESG (Environmental, Social, Governance). The results showed a significant lead by the six corporate governance factors, led by shareholder rights, in the top six factors. It is thus not strange that analysts and investors often treat it as a separate category (ECCE, 2007). This study will however focus on the quantitativity of the factors, thus focusing on any non-financial disclosure that can be put in quantitative or monetary terms (e.g. points on a DJSI).

4. ANALYSTS AND INVESTORS

Analysts and investors are not a homogeneous group, but as only one report will be published, some consolidation needs to be made by the firms (EABIS, 2009). The role played by analysts is largely to transform the mass of public information into relevant information that can be used for investment decisions (Orens & Lybaert, 2010). One can differ between mainstream and SRI investors, between buy-side and sell-side analysts, between passive and active asset managers and between private and institutional investors (ECCE, 2007). A firm issuing a sustainability report will need to know its target audience; although these are always a mix of stakeholders composed of employees, individuals (consumers), external consultants and investors

(Rowbottom & Lymer, 2009). Although SRI is becoming more common (Robeco & Booz, 2008), the SRI focused investors will be more interested in sustainability reports than their mainstream colleagues. Nilsson (2007) segments socially responsible mutual fund investors by their interest level in sustainability; whereas some use SRI purely for profit, others favor sustainability above financial performance or weigh both equally. Within academic research on sustainability matters, the homogeneity of investors is long gone. In a report by GRI (2009) on how ESG disclosure should be used to reach investors, the following scheme was published to indicate the flow of information through the financial services sector:

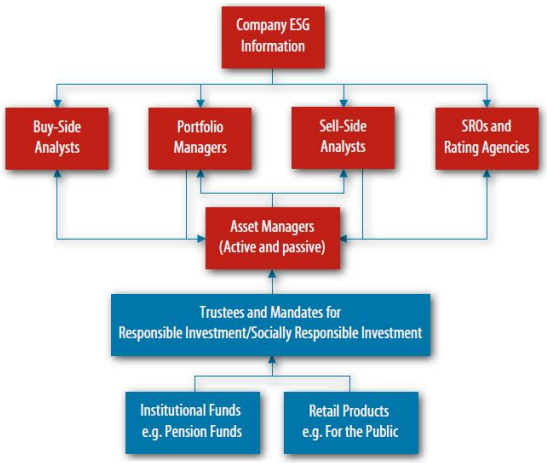

Figure 2: Flow of information through the financial sector (GRI, 2009)

The major discussion is whether buy-side or sell-side analysts are more interested in the firm's sustainability strategy. Mehallow (2010) states in an article those on the buy side are more interested as they use the reports for screening purposes. A research by the European Centre for Corporate Engagement (2007) concludes similarly that sell side analysts use ESG data to a lesser extent than investors. Especially long-only institutional investors are more interested in data published by companies. Ioannou and Serafeim (2010) argue that sell-side analysts, those working for large brokerage firms, are the most valuable stakeholders with regard to CSR communications. Their study covering 546 US based firms from 1993 to 2008 focused on the link between CSR strategies and analyst recommendations. A correlation was found, which tended to become more positive with time. In a dialogue

between researchers and UK sell-side bank analysts set between 2004 and 2006, the tone was more negative (Campbell & Slack, 2010). The analysts indicate that they rarely read sustainability reports or CSR/environmental parts within the annual reports. The only way their attitudes could change would be from fund manager pressure or environmental incidents bearing significant financial risk.

One of the major reasons sell side investors are not influenced by the sustainability disclosure is because there is no universally accepted method of quantifying this information (ECCE, 2007). Their two most important functions are to compile company reports for investors and to observe firm management (Aerts, Cormier, & Magnan, 2007). Information written by companies is regarded to be the single most important source of data and information regarding sustainability (CSR Europe; Deloitte; Euronext, 2003). Although sustainability reporting has become more standardized over time (GRI G3 Guidelines), most sell side analysts are not interested yet.

4.1 Sustainable and Responsible Investment (SRI)

In general, investors speak a different language than sustainability experts, financial figures are different from what is currently reported (WBCSD & UNEP FI, 2010). The investor community has different obstacles to including ESG in investment decisions (EABIS, 2009). They see ESG issues as difficult to articulate and follow different time horizons; where sustainable development is more qualitative and long-term, financial investment is more quantitative and short-run. Those investors focusing on short-term profitability will thus be less likely to invest in SRI than those with long-term profitability in mind (Ioannou & Serafeim, 2010). Intangibles have become an important part of the decisions investors have to make: brand value/goodwill, human capital and social capital are all well known concepts. At the start of the 21st century the European Commission, U.S. Securities and Exchange Commission and the U.S, Financial Accounting Standards Board all came to the same conclusion that intangibles are replacing financial and physical assets in the decision making process (Funk, 2003).

Sustainable and Responsible Investment (SRI) is defined as *"any type of investment process that combines investors' financial objective with their concerns about Environmental, Social and Governance issues"* (Eurosif, 2010). A differentiation is made between Core and Broad SRI, where Core investments select on multiple criteria and can include thematic funds (e.g. green energy) – the Broad SRI incorporates ESG into the financial analysis. Dominated by institutional investors, the Broad SRI investment strategies range from simply excluding 'bad' firms such as tobacco firms to fully integrating ESG principles into the investment strategy. As of December 2009, in the European asset management industry worth around €10.7 trillion, 10% is estimated to be Core SRI investment which increases to almost 50% when Broad SRI investments are added (Eurosif, 2010). In Europe, the Netherlands is the clear leader by market size and growth. It is also the leading country regarding Core SRI. France and the United Kingdom are the second largest markets with a larger amount invested in Broad SRI. It has been predicted that by 2015, 15-20% of all global assets under management will have the SRI label; making responsible investment a mainstream activity (Robeco & Booz, 2008).

As one of the few sources of public information, the reports companies publish will become more significant as SRI advances. Investors which have ESG standards integrated into their financial analysis will take their data from reports, but also from engagements with the sustainability managers (WBCSD & UNEP FI, 2010). The investors themselves are letting this know too. In the second half of 2010, a group led by Aviva Partners, representing more than 550 billion US dollars in management, launched a campaign requesting stock exchanges to add reporting to their listing rules (Waterworth, 2010). This process was facilitated by the UN PRI (Principle of Responsible Investment), a network of institutional investors which put up and work according to six responsible investment principles (PRI, 2010).

Something that goes beyond SRI is the concept of impact investing. It has been described as a hybrid between philanthropy and private equity

(Sullivan, 2010). Here the investor only supports companies and projects with clear sustainable outcomes, such as microloans and clean energy. For this too, reporting standards have been created, the Impact Reporting & Investment Standard (IRIS) has been developed by the Global Impact Investment Network (GIIN). One of the main reasons for this standard is again the lack of transparency; impact conscious people are not willing to invest when they are not aware what is happening with their money (GIIN, 2009). Northern Trust mentions that the problem is larger, that public awareness is low with less than 0,1% of capital currently 'impact invested' (Waterworth, 2010).

Chatterji, Levine, & Toffel (2009) characterize the motivations of social investors as financial, deontological, consequential, and expressive; these either on their own or combined. Financial motivations refer to the thought that sustainable firms to have better financial returns. Deontological is mostly screening, not wanting to work with companies who have made/make profits from unethical operations. Cosequentialists, they state, are those who reward good behavior and attempt to grow sustainable firms. Lastly, expressive socially responsible investors use the transactions as a medium, to show how sustainable they actually are.

4.2 Information Asymmetry

A study by the Turku School of Economics and Tofuture Oy, quotes a proposal by Healy & Palepu from 2001 stating that sustainability reporting could decrease information asymmetry between a firm and its stakeholders (Niskala & Schadéwitz, 2009). Their research attempts to define how companies link sustainability and financial value, and make a classification scheme on how well these valuations are incorporated in the reporting of companies. To quote: *"Our overall valuation argument is that GRI disclosures enhance corporate transparency and, therefore, reduce the uncertainty about corporation's future cash flow".* This coincides with the KPMG (2008) statement that there is a growing interest in sustainability data from

investors, more insight into future cash flow can decrease information asymmetry.

When groups of investors are in possession of different data/information, information asymmetry exists (Chang et al., 2008). This then leads to dispersion within analyst recommendations. Not to be confused with information asymmetry between investors and management (insiders). This would relate more to the volatility of stock prices, as the investor or analysts is not capable of making a correct valuation. Value relevant information provides investors with the ability to make cost-benefit trade-offs, the disclosure can thus be utilized to minimize the cost of capital (Aerts, Cormier, & Magnan, 2007). This then relates back to the firm as it is in its own interest to minimize the cost of capital, thus to minimize information asymmetry (Berk & DeMarzo, Corporate Finance, 2007).

Aerts et al. (2009) state that *"Reassuring a firm's investors about various aspects of its operations or performance, expanded disclosure leads to a reduction in information asymmetry between managers and investors and, ultimately, to a reduction in information costs to be incurred by investors."* Chang et al. (2009) however carried out a similar study which did not result in this conclusion. They did find that the firms with an already low level of information asymmetry were less affected by the disclosure quality. Several proxies have been used for information asymmetry, including liquidity (Petersen & Plenborg, 2006) volatility (Cheng et al., 2006, Cormier et al., 2009, Oren & Lybaert, 2010), dispersion (Drobetz, Grüniger, & Hirschvogl, 2010) & Tobin's Q (Cormier et al., 2009). These indicators are however more part of classical financial theory, market microstructure based theories are becoming more popular.

A study by Clarke & Shastri (2001) highlights the effectiveness of microstructure based measures of information asymmetry. One reason for this, is the fact that asymmetry can be calculated around an event, for example the release of a sustainability report. Microstructure based research can be defined as an analysis focused on the process by which securities are

traded and how it affects prices, volumes and trader behavior (Münnich, 2003). The bid-ask spread is one of the most commonly used microstructure based measures of information asymmetry (e.g. Chang et al., 2009, Cheng et al., 2006 and Petersen & Plenborg, 2006). As some traders possess more information than others, they can buy at a too low price and sell when it is too high. On these transactions the market maker would not make any profit, and needs to offset the losses by increasing the bid-ask spread (Bagehot 1971, as cited in Clarke & Shastri, 2001). An increase in bid-ask spread could therefore entail that there are informed and uninformed investors, thus signaling information asymmetry among them.

Hasbrouck (1991) mentions that the bid-ask spread can have a dynamic response to trades. This would thus suggest that information asymmetry is variable. Several studies however do not incorporate the time/event factor of information asymmetry. Petersen & Plenborg (2006) conclude from a study based on the Danish market that voluntary disclosure of firms lowers the average bid-ask spread among companies. Where Cheng et al. (2006) see similar results in that Singaporean firms with higher levels of voluntary disclosure in their annual reports have lower bid-ask spreads as well as trading volume and stock price volatility.

Brooks (1996) states *'Unless the spread is decomposed into its components, the quoted spread is a noisy proxy for the level of information asymmetry."* For this, different models have been created to split the bid-ask spread variable into different components, including adverse selection costs, inventory holding costs and order processing costs (Choe & Yang, 2006). One of the most commonly used event based information asymmetry proxy, is the concept of Probability of Informed Trade (PIN). With the intuition that with information asymmetry, the proportion of informed trade, compared to uninformed trade will increase (Duarte, Han, Harford, & Young, 2006). This seems viable, as information asymmetry is a necessary condition for informed trading (Benos & Jochec, 2007). Ertimur (2007) summarized the

finding of different papers of Ealey, O Hara, Kiefer and Hvidkjaer (1997, 1998, 2002), and provides the following equation:

$$\text{PIN} = \frac{\alpha\mu}{\alpha\mu + \varepsilon_b + \varepsilon_s}$$

Equation 1: PIN (Ealey et al. 2002)

Where: α is the *probability* of an information event, μ is the *rate* of informed trade arrival, ε_b is the arrival rate of *uninformed* buy orders and ε_s stands for the arrival rate of *uninformed* sell orders (Ertimur, 2007). She further states that there has been a shift from bid-ask spreads to PIN to measure information asymmetry *among investors*. Where the PIN has a significant correlation with the bid-ask spread (Easley, Kiefer, O'Hara, & Paperman, 1996). Criticism on PIN is that it might indicate information asymmetry. This does not imply informed trading as there might be other factors correlated with both PIN and spreads (Benos & Jochec, 2007).

Choe & Yang (2006) compare four commonly used market microstructure measures of information asymmetry. Including PIN, and three that are more linked with the bid-ask spread: Hasbrouck's model (1991), the Huang and Stoll model (1997) and a model by Madhaven, Richardson and Roomans (1997). They find a strong correlation between the latter three, but not with the measure of PIN. Where to ones based on the bid-ask spread show a significantly negative relationship with firm size and turnover; conventional wisdom confirms this as larger firms show less information asymmetry (Brooks, 1996). This concurs with Benos & Jochec (2007) who also criticize PIN.

This study however focuses on the difference between firms according to the quantitativity of their sustainability disclosure. Although this is an event itself, there is no recognizable difference between the firms releasing their reports, as most release them annually together with the financial statements or both in one integrated annual report. Furthermore the microstructure based measures are more focused on the factors surrounding the release than the content itself. For this reason, the proxy used for information asymmetry will

be of the more classical type, focusing on a simpler proportional bid-ask spread, analyst dispersion and the volatility of the stock price.

Orens & Lybaert (2010) conclude from their study on sell-side analysts that: *'Financial analysts following firms with higher leverage and higher stock return volatility use more non-financial information than financial analysts covering firms with lower leverage or lower stock return volatility.."* In other words, when less information can be retracted from financial statements, analysts focus more on non-financial disclosure. Cormier et al. (2009) use the amount of analysts following a stock as a proxy for information costs. As larger firms are often covered by more analysts, the amount will have a moderating effect on the impact of the quantitativity of the sustainability disclosure on information asymmetry.

4.3 Market Value

The stock price or market value of a company is seen as the most objective way of rating a firm. From basic finance textbooks we can assume that the market based valuation consists of different elements. Analysts and investors evaluate the current price and compare it with the cost of capital of a firm and its future cash flows (Berk & DeMarzo, Corporate Finance, 2007). Future cash flows are always a risky prediction, most often provided by analysts – who publish their suggestion the form of sell, buy or hold. The possibility to reduce the cost of capital is however more concrete. Studies in the past have proven that voluntary nonfinancial disclosure reduces cost of capital, and firms who have a relatively high cost of capital would then start to disclose voluntarily (Dhaliwal, Li, & Yang, 2010).

In their study, Dhaliwal et al. (2010) focus specifically on CSR disclosure and its link to the cost of capital. They find significant proof for both their hypotheses that firms disclosing voluntarily on CSR have a lower cost of capital for at least the two years after the first disclosure. Furthermore companies with a high cost of capital are more inclined to disclose. This again proves that there is a link between investors, analysts and the sustainability of a firm. The major reason explained would be that once a firm proves that it

does act and think in this manner, it attracts different more specialized types of investors, who will have better knowledge of the firm and also less dispersion will occur between the analysts. To test if the quantitative aspect of the sustainability disclosure has effect on these market related issues, the scores will be compared to the cost of capital and stock price of each included firm.

4.4 Ratings and Indices

The major asset external organizations providing sustainability ratings have is their independence. They can provide an independent assessment of different aspects of a firm's activity (Bachoo, Burritt, & Tan, 2006). Oxford defines a rating as *"a classification or ranking of someone or something based on a comparative assessment of their quality, standard, or performance"* (Oxford University Press, 2011). When rating the sustainability aspect of a firm it is often based on two aspects - performance, disclosure or a combination of the two. These are then examined based on the firms' past performance and sustainability management activities plus their future outlook, based on standards and procedures, strategies and proven engagement (Chatterji, Levine, & Toffel, 2009).

The indices and ratings are becoming more and more common. There were only 21 in 2000 but by the end of 2010, 110 different sustainability ratings available (SustainAbility, 2010). Where 33% of the ratings focus on sustainability performance, 7% on disclosure/transparency and the rest on a combination of the two. Around sixty percent request information from the companies, the rest uses solely public information. Also the orientation between the ratings differ, some are targeted at consumers, others at NGOs and governments; the ratings targeted at investors are however the most well known.

The Rate the Raters research by SustainAbility (2010) showed that the FTSE4Good, Carbon Disclosure Project Leadership Index and Dow Jones Sustainability Index are the only three ratings that were rated on credibility as high or medium, by ≥50% of the participating sustainability experts.

Another investor targeted rating, the NASDAQ Global Sustainability Index, excluded Microsoft and 22 other firms for the lack of quality in their disclosure, not enough quantitative metrics were released (NASDAQ, 2009). This shows that without having quantitative sustainability disclosure within reporting process, firms risk not being included in ratings.

Ratings are becoming more interesting for investors as they add to the transparency, pure financial performance is not the only necessary type of disclosure any longer (Márquez & Fombrun, 2005). Companies such as DSM (life sciences/nutrition) and TNT (postal/parcel) have the goals to be top of the industry in e.g. the Dow Jones Sustainability Index and FTSE4Good. Also investors can acquire details, rankings and lists by companies such as MSCI or SAMgroup. One of the more public rankings is CSRHUB, which uses data from over eighty rankings and develops a meta ranking covering more than 5000 publicly listed companies (CSRHUB, 2011; SustainAbility, 2010).

With over half the ratings at least taking disclosure and transparency into account, the quantitativity factor should be very relevant. KPIs are regarded as carrying more information than pure narrative information, indices and ratings requesting company input would therefore higher value quantitative input. With this in mind the link between quantitative sustainability disclosure and ratings should be present.

5. DISCLOSURE FACTORS

Quantitative sustainability disclosure is not only about the figures, the way these figures are presented and what surrounds them adds to the readability and improves the flow of information coming from the company to the investor. The next sections will show the different factors affecting the usability of the quantitative disclosure and reasons why they have been included in the study.

5.1 Integrated Reporting

Integrated reporting is the concept of disclosing all relevant financial, environmental, social and governance information in a single format. On the website of GRI a document can be found stating which firms are releasing reports based on the GRI guidelines. As of 2009 this document included whether the report was integrated or not. In that year 181 out of 1491 reports were stated to be integrated, in 2010 227 out of 1832 reports were integrated, both amounting to roughly 12% (GRI, 2011). This increase shows that firms who had already been reporting on sustainability shifted towards integrated reporting, but with large amount of first time reporters the relative amount stayed the same.

By 2010 a committee named the International Integrated reporting Committee had been formed, here both financial and sustainability reporting experts have come together to define how the two can be merged best (Kinloch-Massia, 2010). The use of the integrated reporting affects various stakeholders, the companies themselves through e.g. costs savings of merging financial and sustainability analysis and collaboration between departments (Druckman & Fries, 2010). But also stakeholder engagement will be different where the sustainability data will be presented as more relevant to the investor rather than to the consumer in showing how good the company is behind the product that they are buying (Kanzer, 2010).

As the stakeholder focus in this study is on investors and analysts, whether a report is integrated or not should be taken into account. By definition an integrated report is the case when only one report takes into account the financial plus ESG information. However, some companies disclose an enormous amount of ESG information where others only focus on several smaller aspects. Furthermore, the data can all be merged into one list of most important indicators, or the annual report can include different sections where one is focusing on the financial and the other on the non-financial. Within the study therefore a total of 5 points can be allocated for the factor of integrated reporting. Zero points are only given if nothing on sustainability is

mentioned; one to five points are allocated depending on the degree and scale of non-financial data and information that has been included in the report.

5.2 Assurance

In an international survey of sustainability reporting done by KPMG in 2008, 40% of the sustainability reports issued by the 250 largest firms had formal assurance (KPMG, 2008). They stated that there were large differences between countries, with USA and Canada at the lower end. By 2010, the North American market for sustainability reports was still lagging with only 31% of reports formally assured and only 27% with a + behind their GRI rating (PWC, 2010). Perego (2010) states that Big 4 assurance providers (Deloitte, Ernst & Young, KPMG and PWC) provide higher quality assurance reports regarding reporting format and procedures. This as opposed to 'sustainability boutiques' smaller companies that specialize in sustainability, which have less reputation to lose and would more likely to provide a false positive statement than a Big 4 firm. Perego further states that countries with weaker legal systems are more likely to choose a large accounting firm as an assurance provider. This confirms the lagging behind of North American firms where the shareholder protection is generally known to be better than in Europe. Vanstraelen, Zarzeski, & Robb (2009) studied over 2000 firms between 2002-2004 on their sustainability report assurance. Here they do not find proof that firms in weaker legal systems are more likely to choose large accounting firms, they do however find a link between environmental risk and this choice. Firms with a higher 'carbon footprint' are more likely to be assured by a Big 4 accounting firm.

When related to the quantitativity of the report, one that is formally assured by a Big 4 accounting firm should be seen as more reliable than one which is not. These firms are experts concerning quantitative and monitary data and thus should be more capable when assessing the reports. Manetti & Becatti (2009) comment on assurance standards that they are not standardized enough yet, the level of assurance is not clearly explained and that the links

with financial audits and materiality are not clearly defined. They state that when improved assurance standards would provide greater relaiability and effectiveness. Therefore, whether the assurance report is to be based on GRI G3, ISAE3000 or AA1000 Assurance Standard will not be incorporated in the study.

5.3 Materiality

No company is the same, a sustainability report should reflect the company, not include as much data as possible, this concept is called materiality, defined by GRI as *"The information in a report should cover topics and Indicators that reflect the organization's significant economic, environmental, and social impacts, or that would substantively influence the assessments and decisions of stakeholders"* (GRI, 2010). AccountAbility states three main steps to achieve a workable materiality structure. First, to identify the issues, second to determine their significance within the company and third, to embed these in the internal decision making process and external review, i.e. assurance (AccountAbility, 2006). Most visible within the report would be step 2, a matrix defining the internal and external significance of the issues. Although stating the materiality would be more indicative than anything else, it increases the significance of the quantitative figures stated. As it shows the importance of the data to the company, it should bring extra value to the disclosure for investors and analysts.

5.4 XBRL

The eXtensible Business Reporting Language (XBRL) standard is presented best by the organization behind it. *"The idea behind XBRL, eXtensible Business Reporting Language, is simple. Instead of treating financial information as a block of text - as in a standard internet page or a printed document - it provides an identifying tag for each individual item of data. This is computer readable. For example, company net profit has its own unique tag* (XBRL INTERNATIONAL, 2010). These XBRL exhibits will thus be able to show the firm's financial statements, footnotes and schedules in a computer language making the information readable for software. This essentially takes away

the work from analysts and other users who will only have to select the information they need and will not have to read through the annual reports (Purnhagen, 2010).

In a study focused on the early adopters of XBRL in the Korean market, researchers found that the adoption of XBRL significantly lowered the information asymmetry (Yoon, Zo, & Ciganek, 2011). These concepts and studies are however all focused on financial disclosure, for which standards are readily available (US GAAP, IFRS). During an online seminar (webinar) on the status of non-financial performance a member of the audience asked how the presenters thought about XBRL for sustainability. The main reason that sustainability disclosure in the form of XBRL is not yet used, is the lack of *mandatory* standards and disclosure frameworks (Frank, 2011). The GRI has also released statements concerning the disclosure through XBRL, a taxonomy (list of labels) had been created to be able to translate the sustainability KPIs into the XBRL format (GRI, 2010). However for sustainability disclosure to become fully integrated with financial disclosure through XBRL two major hurdles need to be overcome (Watson & Monterio, 2010). First, *"Commercial strength ESG XBRL taxonomies need a neutral, trusted organization to coordinate their development"* for example the FASB or the IFRS. Second, *"Key stakeholders must come together to support a coordinated ESG XBRL taxonomy and collaborate on global adoption".*

Within the research, none of the firms in the sample had any references to the use of XBRL on sustainability. Thus, even though a decent amount of literature seems to exist on the matter it is not yet so relevant to determine the quantitativity factor of the studied firms. As integrated reporting and XBRL will become more common, and as more forceful disclosure regulations will apply, the impact can be studied more closely.

5.5 Sustainability Accounting

Where some claim that sustainability accounting is a fad and will disappear in time, others see an sustainability or environmental accounting system to be unavoidable and business will not be able to escape the consequences of

their impact on the environment (Burritt & Schaltegger, 2010). As with general accounting, a firm must differentiate between internal and external sustainability reporting. These have been coined as inside-out and outside-in approaches; with inside-out the focus lies on supporting the internal decision making process; outside-in has more to do with the needs of the stakeholders than anything else (Burritt & Schaltegger, 2010). As there is demand for both, a combination of the two would be best, supporting the managers while providing the stakeholders with their requested information. They call this 'twin-track' and link this to an earlier system called eco-control. The concept of eco-control is to have an environmental monitoring system integrated within the general management control systems. Henri & Jean (2010) investigate whether implementing the eco-control systems has an effect on the economic and environmental performance of a firm. They list the following ways to do this, incorporating quantitative environmental data within the management controlling system:

1. Developing specific performance indicators (e.g., inputs of energy, outputs of solid waste, financial impact, etc.).
2. Frequently using those indicators to monitor compliance, to support decision-making, to motivate continuous improvement and for external reporting.
3. Fixing specific goals in the budget for the environmental expenses, incomes and investment.
4. Linking environmental goals and indicators to rewards.

These can then be utilized for internal performance and compliance management and external reporting. Their results showed that within a certain context (high visibility, size, environmental exposure), a mediating link of environmental performance could be found between eco-control and economic performance. This research was only performed in an environmental scope; nevertheless the concept can be extended towards other parts of sustainability (Burritt & Schaltegger, 2010).

	Internal	External
Process	Organizational Systems	Stakeholder Relations
Outcome	Regulatory Compliance	Environmental Impacts

Table 1: Corporate Environmental Performance Matrix (Ilinitch, 1998)

Illinitch (1998) presents a good overview on environmental performance, when extending this towards sustainability, one can visualize the different related aspects. Sustainability reporting is only a small aspect of the concept, in table 1 it would fit in the 'process row' and 'external column' of the overall sustainability performance concept.

The result from a sustainability accounting system would be a structured measuring system of different types of indicators. This would then contribute to the quantitativity of the firm's sustainability strategy as internal goals will be more easily set and measured and external reporting can benefit from accurate disclosure possibilities. Therefore, although not quantitative in itself, it will be adopted within the quantitativity coding scheme of the research.

6. EMPIRICAL RESEARCH

6.1 Hypotheses

The main goal of the research is to test if quantitative sustainability disclosure has more impact on investment decision making and stock analysis than qualitative sustainability disclosure. Before testing the impact of quantitativity however, we should test the impact of sustainability, if this has impact or not. Non-Financial forward looking disclosure has been proven to be significantly related to analyst dispersion (Vanstraelen, Zarzeski, & Robb, 2009). Therefore as a prior check for the consistency of the model we check for the effect of sustainability reporting on information asymmetry, scaled on the basis of GRI application levels (from C to A+).

> *Hypothesis 1: GRI application level is negatively linked to the firm's information asymmetry.*

The main focus, however, is the quantitativity. Using the coding presented previously a total score of quantitativity will be given for each report and then also linked to information asymmetry. Those with higher scores should in theory be more relevant for investors and analysts and should therefore

also be negatively linked to information asymmetry. This should however be linked to a higher degree than that of hypothesis number 1.

> Hypothesis 2: Total quantitativity score is negatively linked to the firm's information asymmetry.

Although quantitativity is important, there will be moderating factors such as size of the firm and the number of following analysts. Therefore, we will test if quantitativity is more important for smaller and less followed than others.

> Hypothesis 2a: Size and amount of followers have a moderating effect on the link between quantitativity and information asymmetry.

Ratings, rankings and indices are becoming more relevant for firms, investors, analysts, and consumers. Several influential people state that rankings are based on the quality of disclosure, many firms want to score high on them. Will quantitativity be more favorable when looking at rankings? To test this, the top 5 most well known rankings and indices will be used: Dow Jones Sustainability Index, Carbon Disclosure Project Leadership Index, FTSE4Good Index Series, Global 100 Most Sustainable Corporations, Bloomberg SRI (SustainAbility, 2010). This score will then be tested for a link with quantitativity.

> Hypothesis 3: Quantitativity is positively linked with ranking on sustainability ratings and indices.

The major criticism on sustainability has always been that it is more a cost than a benefit, and that a corporation should above all focus on profitability. As nowadays SRI has begun evolving into a mainstream investment activity, signs are beginning to show that sustainable firms are indeed performing better than others (Ioannou & Serafeim, 2010). The link between quantitativity and performance will be difficult to achieve, taking however

one step backward and looking at market valuation might however show a relation.

> Hypothesis 4: Quantitativity is positively correlated with market value – evaluated through cost of capital.

Testing these hypotheses will ultimately show the significance of quantitative sustainability disclosure and prove its importance. Test for endogeneity will be conducted as well as the correlation between GRI application level and the quantitativity of the sustainability reports. The theoretical framework (figure 2) indicates how the hypotheses are interlinked. Corporate Sustainability Performance and Corporate Financial Performance are purely for indicatory reasons to show that there might be a link, however as many studies before have tried to find a link, and failed, this will not be incorporated in this study.

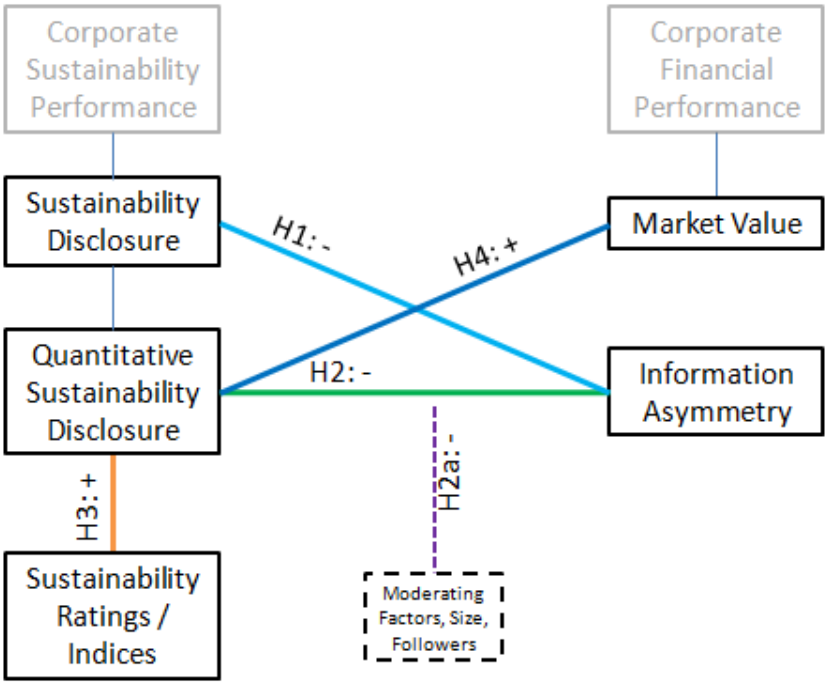

Figure 3: Theoretical Framework

6.2 Content Analysis and KPIs

The primary aspect of the research is a content analysis in a broad sense, assessing the content of a specific type of communication, in this case

sustainability and annual reports (Joseph & Taplin, 2010). Variables will be counted using the 'disclosure occurrence' principle, where each variable is counted if it is mentioned and not when it is not mentioned. This is done regardless of the amount of text, space, or weight used in the report, also called 'disclosure abundance'. The topic is focused on the link between quantitative data disclosed and investor valuation, not how much text is used to define or explain the items.

Thus, data will be collected by reviewing the reports of selected companies. In addition to a quantitativity score on environmental, social and governance disclosure, scores on integrated reporting, assurance, materiality, accounting methodology and a total quantitativity score will be given for each report. Quantitativity can defined in different ways, Cormier et al. (2009) studied the effect of human and social capital disclosure based on qualitative and quantitative data provided. Listing different items each possessing either qualitative, quantitative or both types of elements, upon which they based their comparison. Others give rate disclosure by giving one point for the presence of the element and an additional point if this data is quantitative (Cheng, Courtenay, & Krishnamurti, 2006). Dragomir (2009) extends this method and focuses solely on quantitative disclosure. He gives 0 points when no quantitative data is present, 1 point when it is presented for the current period, 2 points when this is made comparable with previous years, 3 points when in addition to the first two calculation techniques are mentioned and 4 when above all the performance can be compared with appropriate benchmarks – i.e. an industry/market common denominator.

The *KPIs for ESG* report by EFFES/DVFA (2010) show similar guidelines stating that financial analysis cannot be executed using isolated (mere absolute/relative) data. Further stating the *"diachronous underlying dynamics"* and *"synchronous/industry dynamics"* are necessary for keeping the data comparable over time and between firms, without this data is unusable for the investor.

In line with the above mentioned, within this research, several aspects of quantitativity were measured. First, the presence of an absolute figure is associated with one point. Additionally points are given for ≥1 years of historical data, a future goal and lastly for a common denominator which makes the data comparable with other firms. Thus a total of four points can be allocated for each piece of sustainability disclosure counted based on occurrence. The quantitativity of a disclosed factor is therefore ordinal on a scale of 0-4. Some information might seem to have numerical value, however when looking at it more closely – no practical knowledge can be gained, specific examples like the ones below are therefore excluded from the coding system:

- Cumulative data (between 2005 and 2009 xx people received training)
- Pure relative data (CO2 reduction of 12% since 2007)
- Future target without a date (our goal is to reduce water consumption with 15%)
- Case studies, Examples of best practices (in our Sao Paulo plant LTIF was reduced to 2.8)

The additional factors which increase the significance of the quantitativity have been added to the coding scheme: the inclusion of an assurance report, a materiality graph, whether the report is integrated or not and description of the sustainability accounting method.

The different elements are classified under subsections environmental, social, governance and other. The environmental and social indicators are based on the GRI G3 guidelines, consisting of 79 performance indicators, of which 49 are said to be 'Core' stating that these should be material for all reporting firms (GRI, 2008). This is in line with the methodological approach of Daub (2006) who argues that these guidelines are most comprehensive and due to its broadness it can be used to analyze a variety of companies. The 30 additional performance indicators provide more insight but are not necessary, e.g. whereas the disclosure of greenhouse gas emissions is core, indicating initiatives to reduce this is considered an additional indicator. Each *additional KPI* was therefore rated at half the value giving a maximum of

two points, whereas a core indicator was fully rated with the maximum value of four.

The GRI indicators are also comparable with the fourth most well known sustainability rating: the Global 100 (SustainAbility, 2010). Created by Corporate Knights Research Group, Inflection Point Capital Management, Global Currents Investment Management and Phoenix Global Advisors; they are among the most transparent regarding methodology. The indicator categories are listed in table 2 below:

G100
Energy Productivity
Water Productivity
Carbon Productivity
Waste Productivity
Safety Productivity
CEO-to-average worker pay
Taxes paid
Sustainability Pay Link
Innovation Capacity
Transparency

Table 2: G100 Categories

The indicators listed by the GRI can be found in Appendix one, in total 6 different categories of Economic, Environmental, Labor, Human Rights, Society, and Product Responsibility cover 34 sub categories which in turn consist of those 79 indicators. Less commonly used are corporate governance KPIs, the DVFA however included several governance indicators focusing on political contributions, corruption, litigation, managerial training and performance reviews. For this reason, several 'social' GRI KPIs were converted to governance KPIs, the overview of all key performance indicators used to assess the reports can be found in appendix three.

This resulted in 30 KPIs for both environmental and social and 22 indicators for governance including the four additional factors. With a range of 0-4 for each value except the additional factors, the theoretical maximum was 269 of which 94 were environmental, 98 social and 77 for governance.

6.3 Data Collection

The scope of the study covers the largest (publicly traded) companies from the Nordic EU countries (Denmark, Finland and Sweden) plus the Netherlands. The choice for these was made with the legal system in mind, all countries have fairly weak shareholder protection which would make voluntary disclosure more significant for these. This is supported by Welford (2005) who argues that these countries have a more liberal democracy compared to southern European countries explained by historical trends and economic development. and With the use of the Amadeus company database, companies listed on stock exchanges: OMX - *Nordic Exchange Copenhagen, OMX - Nordic Exchange Stockholm, Euronext Amsterdam* or *OMX - Nordic Exchange Helsinki* were selected. To increase comparability only environmentally intensive industry categories were chosen, energy, manufacturing, transport; for a full list see appendix 2. As the measurement of sustainability performance is not free, a cut off was made for firms with less than €50 million in revenues. This then resulted in an initial sample of 124 firms.

For each firm the sustainability report or annual report released in 2010 covering the book year 2009 was downloaded or captured in case of an HTML-only publication. The content analysis was described in the previous section, where one coder will analyze each report according to a consistent scaling method. Giving each firm a score on sectional quantitativity score, a total quantitativity score and when present, an application level (already supplied by GRI).

Although time consuming, the quantitative nature of the research made it easier than other types of content analysis. The surveyor only had to look at numbers, graphs and tables, any pure text elements could be skipped. Only having to focus on quantitative indicators also made it less likely that different aspects would be forgotten or missed.

While searching for the reports, 13 firms were omitted due to either operational change (merger, takeover), website/report not available in

English or due to unavailability of the 2009 report, a telecommunications services firms was wrongly listed as a postal and courier activities firm and in one case the sustainability report was bi-annual with no release in 2009. The remaining 111 firms were fairly consistently distributed by country and revenue. With the largest firm having revenues of >40 billion Euros and the smallest having revenues of a little over 50 million Euros.

Countries	Count	Average Op. Rev.
DK	25	€2.407.397.427
FI	38	€2.585.145.634
NL	33	€4.539.909.212
SE	15	€1.553.163.805
Total	111	€2.986.801.179

Table 3: Country Distribution

Of the selected firms, 33 were using the GRI guidelines as a basis for their sustainability report where thirteen firms released a non-GRI based non-financial, sustainability, CSR or environmental report. Of the remaining 67 firms, 52 included sustainability in their annual report, whereas 15 did not have any statement on sustainability disclosure whatsoever.

To test for verifiability 10% of the reports were chosen at random. A random number generator (based on ambient sounds) gave twelve values between 1 and 111. This results in three firms with revenues between 5 and 10 billion Euros, three with revenues between 1 and 5 billion Euros, three with revenues between 100 million and 1 billion Euros and three with revenues below 100 million Euros. Five were from Denmark, three from the Netherlands and two from both Finland and Sweden. The sustainability and annual reports together with the coding were handed over to a peer student who recreated the coding of 12 reports (10%) and tested whether or not the content analysis could be duplicated.

The results were common to a certain extent. The mean of the absolute differences of total quantitativity scores was 5,9, stating that on average the verification coding was 6 above or 6 below the score in the study. However most of the verification scores were higher than the initial scores. The

correlation between the two arrays was 0,95. All in all the verification added value to the study by showing that the analysis is reproducible.

The variable sustainability disclosure used to test hypothesis H1 was split into two types, first the binary DISC – whether or not the firm had a standalone or integrated sustainability report; the second is defined by the given GRI application level, ordinal ranging from undeclared to A with values from 0 (not present) and 1-4 (undeclared, C, B, A). This is in line with Pullham (2008) who studied the effect of voluntary disclosure covering: Social Responsibility Report, Corporate Responsibility Report, Sustainability Report, Triple Bottom Line Report, and Health, Safety, and Environmental Report. These disclosure variables made it possible to have a more simplified analysis on the state of sustainability disclosure of firms.

The financial data has been gathered using Thomson's Datastream which includes I/B/E/S. The data covers 2010, this relates to the year when the reports were released, not the years which the analyzed reports cover. Data gathered included total market value, stock price volatility, analyst dispersion, amount of analysts following, amount of public listings and market-to-book ratio.

Through Thomson' DataStream, the data of the firms was collected categorized by their ISIN number. Several static and time series queries were then run through Microsoft Excel. The data types gathered at daily intervals – with the DataStream codes in brackets were - Price (P), ask-price (PA), bid-price (PB), volatility (VOL) and volume (VO). The bid-ask spread was calculated proportionally (referred to as PBAS) to the stock prices, as the different stock exchanges use varying currencies. The higher the proportional bid-ask spread, the wider the spread, the higher the information asymmetry. It can also be a proxy for liquidity, which is in common literature linked again to information asymmetry (Hasbrouck & Seppi, 2001; Lakhal, 2004). The PBAS for the stocks are calculated as follows:

$$\text{PBAS}_{it} = \frac{(\text{Ask Price}_{it} - \text{Bid Price}_{it})}{[(\text{Ask Price}_{it} + \text{Bid Price}_{it})/2]}$$

Equation 2: Proportional bid ask spread (Cheung, 2011)

Volatility was calculated in a similar manner. The daily price quotes were gathered for the year 2010 which were then compared to each other for change within. Based on the Black & Scholes paper from 1973, assuming that prices are log normally distributed we compared the prices log relatively (Kotze, 2005). The logarithmic differences between periods were calculated as follows:

$$u_i = ln\, S_i \,/\, \ln S_{i-1}$$

Equation 3: Log relative return

Taking the standard deviation of these returns, and multiplying it by the square root of observations then gave the historic volatility for the year 2010 for each stock, used as a second proxy for information asymmetry. Taking the cumulative standard deviation of these multiplied by the square root of the amount of observations (*h*) then gives the historic volatility for each stock, shown in equation 4. Historic volatilities were also calculated on a monthly basis, to see if there were any clear differences throughout the year.

$$\sigma_{an} = \left(\sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(u_i - \bar{u})^2}\right) * \sqrt{h}\,)$$

Equation 4: Historical volatility

These annual volatilities are then provided in the form of a percentage. Zero percent would indicate that the price did not fluctuate, at ten percent, that year, one standard deviation, i.e. 68.3% of the times the price fluctuated between -10 and +10% of the average price. When compared to the VOL data type from DataStream of which the result can be found in figure 4, the horizontal axis show the VOL data type, whereas the vertical shows the volatility calculated with equations three and four.

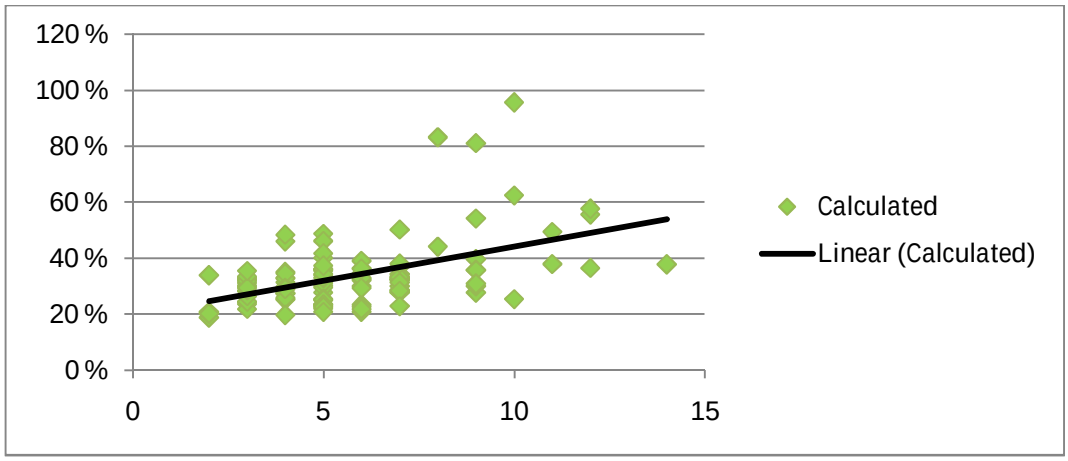

Figure 4: Volatility comparison

The VO data type indicating daily volume traded in 1000s gave the back data used to analyze the liquidity of the stocks. The majority of the stocks were heavily traded at an average of 700.000 trades per day. Three stocks were traded on less than 50 per day on average.

Analyst dispersion was collected using Thomson One Banker from the I/B/E/S database. The variable is based on analyst recommendations. For each firm the recommendations for sell, underperform, hold, buy and strong buy were taken, of which the standard deviation was taken as analyst dispersion. The sum of frequencies was then used as a proxy for the amount of followers. Eight observations are omitted due to no registered recommendations. When we increase the minimum amount of following analysts to 2 per firm the number of omitted observations increased to 24. Equation 5 below shows the calculation made, as can be seen it is a simple Standard deviation analysis between the observed between the mean and each individual recommendation.

$$Analyst\ Dispersion_i = \sum_{n}^{i} \frac{(x_i - \bar{x})^2}{n-1}$$

Equation 5: Analyst Dispersion

For the fourth hypothesis the variables of stock price growth and cost of capital were created. Again using Thomson One Banker, but retrieved from the Thomson Financial Database. Weighted Average Cost of capital (WACC) was calculated by adding the weighted costs of debt, equity and preferred

stock together. The growth of the stock prices was determined by starting with the index number 1 and adding the cumulative growth (decline) in stock price by multiplying the value by 1 + monthly growth (decline) for the 11 changes in stock price during 2010. This resulted in a cumulated stock price growth of 1,18 (indicating an average growth of 18%) a minimum of 0.35 and maximum value of 2.48.

7. EMPIRICAL ANALYSIS

The research consisted of three main parts, first the content analysis of the sustainability, second the financial analysis of the selected firms and third the comparative empirical analysis of the two.

7.1 Content Analysis

The content analysis resulted in a data table of 8 elements for each firm. A quantitativity score on Environmental disclosure, Social Disclosure, Governance disclosure, a total of these and a score on each of the four moderating factors. This because these 4 additional factors all focus on report elements which on their own are a way of presenting governance. Table 4 shows some initial descriptive statistics of the content of the reports, when looking at the data, fairly consistent minimum and maximum values are found with a fair amount of variation in the means and standard deviations. Finland has the second lowest standard deviation and the second highest mean – in terms of classic statistical theory 68% of the Finnish reports thus had scores between 8,32 and 33,10, Sweden had a smaller and also lower spread, clearly having the lowest scores on quantitativity of the four. The Netherlands on the other hand has both the highest mean and highest standard deviation. The relatively high standard deviation is not very surprising, especially among the medium sized firms, sustainability disclosure has not yet become mainstream whereas for the larger companies it has. This does not mean that the data is not comparable as clear differences in quantitativity can be found.

Country	Min	Max	Mean	Std Dev
DK	0,00	63,50	17,40	15,76
FI	5,00	47,00	20,71	12,39
NL	4,00	60,00	22,68	16,15
SE	7,00	45,00	17,77	10,09
Total	0,00	63,50	20,15	14,11

Table 4: Total quantitativity scores

When comparing the three categories, seen in figure 5 below, similar results can be observed. Most striking are the low quantitativity rates of environmental disclosure in Sweden, low rates of quantitative social disclosure in Denmark and again that Finland and the Netherlands are the clear leaders with respect to environmental quantitative disclosure.

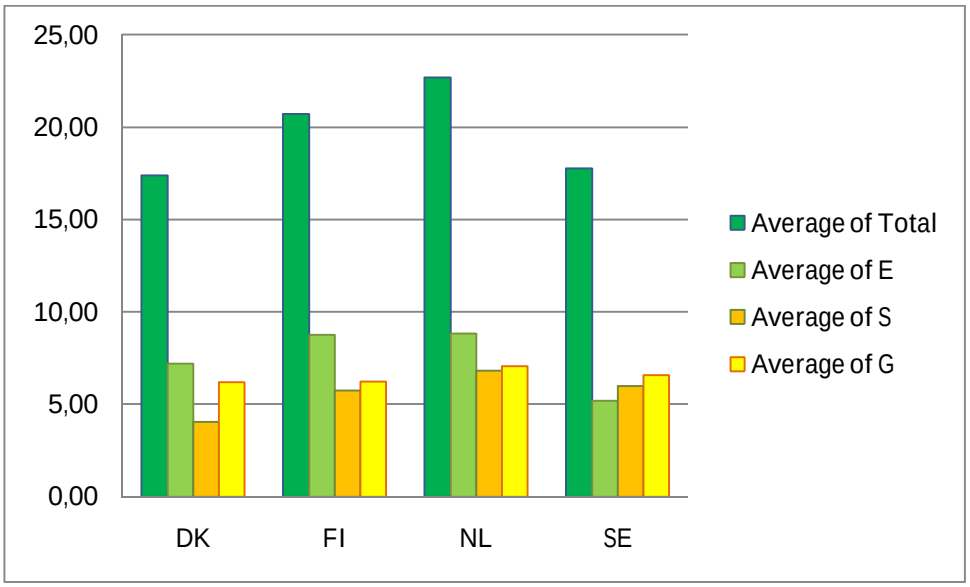

Figure 5: Content analysis categories

Testing these values for significance is done with a paired sample t-test. The quantitativity scores are linked to a country dummy variable and then compared to each other. What we see in the scores is that the scores from Finland are significantly higher than those from Denmark and Sweden, additionally the scores from the Netherlands are significantly higher than Sweden. Surprisingly, they are not significantly higher than those from Denmark. Although the significance is close to 10% the higher standard deviation of the Netherlands makes the difference difficult to support. Similar to figure five, no significant differences exist between the Netherlands and

Finland (both relatively high) or between the QUANT scores of Denmark and Sweden (both relatively low).

		Paired Differences					t	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval Lower	Upper		
Pair 1	DK - FI	-3,17117	17,68352	1,67845	-6,49746	,15511	-1,889	,061
Pair 2	DK - NL	-2,82432	18,57890	1,76343	-6,31903	,67038	-1,602	,112
Pair 3	DK - SE	1,53182	13,35271	1,27313	-,99149	4,05512	1,203	,232
Pair 4	FI - NL	,34685	20,73477	1,96806	-3,55338	4,24708	,176	,860
Pair 5	FI - SE	4,30455	14,80641	1,41174	1,50653	7,10256	3,049	,003
Pair 6	NL - SE	4,38182	16,41547	1,56515	1,27974	7,48390	2,800	,006

Table 5: Paired sample test country QUANT scores

With the same statistical analysis done for the sub scores of ENV, SOC and GOV (seen in table 6) the following significant differences emerge. The first two pairs show that Sweden had significant low scores on environmental KPIs, compared to Netherlands and Finland. For Sweden and Denmark the social disclosures are significantly lower than Finland and the Netherlands. The governance scores are again only significantly lower for Sweden. These show that among the countries, the Netherlands and Finland are statistically support leaders in quantitative disclosure with Sweden clearly having the lowest scores with Denmark somewhere in the middle. Table 7 shows the comparison of the scores within the country, again here only the significant differences are shown. Table 7 shows that in Denmark the social scores are significantly higher than environmental and governance, in Finland environmental scores are significantly higher than the others whereas the Netherland and Sweden have scores that do not significantly differ among each other.

	Paired Differences					t	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval Lower	Upper		
ENVFI - ENVSE	2,29279	7,53551	,71524	,87536	3,71023	3,206	,002
ENVNL - ENVSE	1,91892	7,62786	,72400	,48411	3,35373	2,650	,009
SOCDK - SOCFI	-1,04955	4,58801	,43547	-1,91256	-,18654	-2,410	,018
SOCDK - SOCNL	-1,11712	5,15221	,48903	-2,08625	-,14798	-2,284	,024
SOCFI - SOCSE	1,14865	4,44338	,42175	,31285	1,98445	2,724	,008
SOCNL - SOCSE	1,21622	5,02250	,47672	,27148	2,16095	2,551	,012
GOVFI - GOVSE	1,24775	4,37964	,41570	,42393	2,07156	3,002	,003
GOVNL - GOVSE	1,20721	5,05851	,48013	,25570	2,15872	2,514	,013

Table 6: Paired sample t test, sub scores

	Paired Differences					t	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval Lower	Upper		
ENVDK - SOCDK	,70721	3,26306	,30972	,09342	1,32099	2,283	,024
SOCDK - GOVDK	-,48198	1,45528	,13813	-,75572	-,20824	-3,489	,001
ENVFI - GOVFI	,86036	4,96816	,47156	-,07415	1,79488	1,825	,071
ENVFI - SOCFI	1,03604	4,34360	,41228	,21900	1,85307	2,513	,013

Table 7: Paired sample t test, within countries

When comparing the quantitativity scores with the revenue on a logarithmic scale a fairly evident linear trend line emerges. Figure 6 below is in accordance with table 4 as the scores from the Netherlands show a high spread for all levels of revenue where Sweden is more condense. There are several major outliers, but these have been rechecked and no mistakes were made during the coding of the reports. Some non-proven conclusions can be drawn from the trend lines, for example that in the Netherlands disclosure is more relevant for larger than smaller firms. Here the amount of revenue is more significantly related to the way firms report than in Denmark or Sweden, where the trend line is more flat.

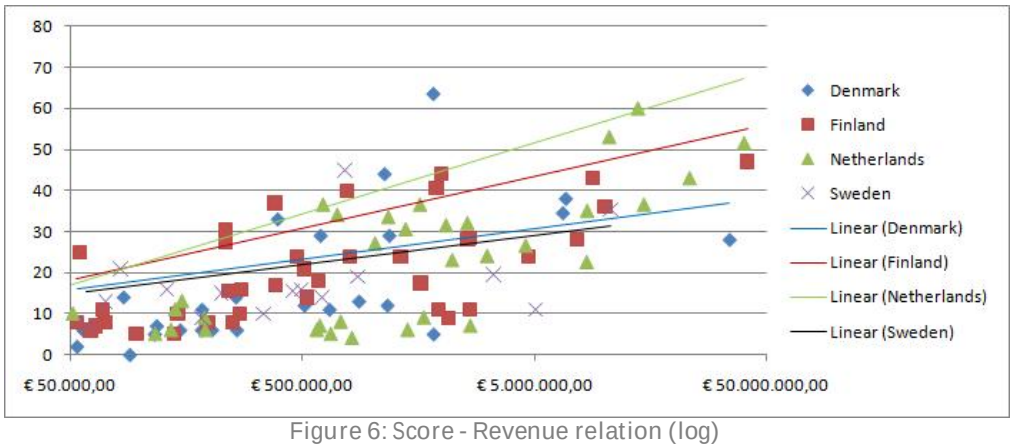

Figure 6: Score - Revenue relation (log)

These apparent differences in quantitativity thus show that there are significant differences between observations and countries compared to the revenue of the firm. They then stand at the base of the empirical comparison presented in the next two sections.

7.2 Descriptive Analysis

Table 8 below gives the descriptive statistics for the dependent, control and independent variables in subsequent sections. For the main independent variable from our study QUANT we see the low kurtosis score indicating the deviations are frequent but modest, whereas the GOV score representing the quantitativity of governance disclosure has a very low kurtosis, indicating few but high deviations. CSRHUB, the publicly available meta analysis (CSRHUB, 2011) has the most missing cases. The 42 available cases are however still enough for statistical representation, thus leaving the variable in the study. Control variable BETA used to measure the systematic risk had several high outliers, their omission caused the lower number of valid data. The highest variances are found for the average volume traded (VO AVG), proportional bid ask spread (PBAS) and the revenues in years 2009 and 2010 (REV2009, REV2010) which proxy for the size of the firms.

For comparability and statistical analysis, these variables were transformed to a logarithmic scale. The non logarithmic variables are then not used in the analysis. The other variables were all normally distributed, some skewed, namely QUANT and profitability (PROF2009, PROF2010) however this is a common case, and no major outliers were found.

Statistics

		N								Std. Error of		Std. Error of
		Valid	Missing	Mean	Median	Mode	Std. Deviation	Variance	Skewness	Skewness	Kurtosis	Kurtosis
Dependent Var.	VOL C	111	2	,336173	,314570	,1893[a]	,1226539	,015	2,564	,229	8,963	,455
	ADAVG	105	8	,76	,80	0	,445	,198	-,112	,236	-,747	,467
	LN_PBASA	111	2	-4,9070	-4,7869	-7,77[a]	1,20680	1,456	,175	,229	,633	,455
	CSRHUB	42	71	54,67	53,00	48	7,534	56,764	,208	,365	-1,095	,717
Control Variables	FFMVAVG2010	111	2	,633417	,655000	,0000[a]	,2499093	,062	-,471	,229	-,598	,455
	LN_VOAVG	111	2	4,1635	4,2830	-3,40[a]	2,62295	6,880	-,473	,229	,175	,455
	LN_REV2009_A	110	3	14,2119	14,1480	10,88[a]	1,81825	3,306	,274	,230	-,173	,457
	LN_REV2010	107	6	14,3320	14,2514	10,84[a]	1,81052	3,278	,263	,234	-,126	,463
	PROF2010	107	6	6,491215	5,150000	1,3200[a]	9,7558535	95,177	2,178	,234	12,362	,463
	BETA	100	13	,73	,71	0	,838	,703	-1,878	,241	22,144	,478
	ANALYSTS	111	2	10,14	7,73	0	10,010	100,207	1,699	,229	3,452	,455
Independent Variables	ENV	111	2	7,937	4,000	,0	9,0215	81,387	,925	,229	-,139	,455
	SOC	111	2	5,707	5,000	5,0	4,0014	16,011	,885	,229	,920	,455
	GOV	111	2	6,509	6,000	6,0	3,2939	10,850	2,182	,229	7,874	,455
	QUANT	111	2	20,153	15,500	6,0	14,1149	199,231	,858	,229	,035	,455
	DISC	111	2	,45	,00	0	,500	,250	,202	,229	-1,996	,455
	GRI	111	2	,80	,00	0	1,347	1,815	1,369	,229	,377	,455

a. Multiple modes exist. The smallest value is shown

Table 8: Descriptive Statistics

When companies who are evaluated by less than two analysts were omitted 24 data points were missing. Standard deviations however decreased as well as the Kurtosis. Due to the high amount of missing observations the new more valid variable had to be used. The results of this was the fact that the Sweden dummy variable had a significant impact on analyst dispersion using the original variable, whereas the revised variable did not, indicating that it was the lack of analysts covering Swedish firms made that relation significant.

	N							
	Valid	Missing	Mean	Median	Mode	Std. Deviation	Skewness	Kurtosis
ANALYSTS2	89	24	12,4223	10,0000	2,00[a]	9,92369	1,680	3,297
ADAVG2	89	24	,8672	,8453	,00[a]	,37421	-,047	-,308

Table 9: Descriptive statistics – revised analyst dispersion

The independent quantitativity variables were tested for correlation. This seems to be the case as the ENV, SOC, GOV have a high Pearson Correlation of .717-.937 with the total score 'QUANT'. The sub variables also have a significant correlation with each other, indicating that disclosure policies cover all variables.

		ENV	SOC	GOV	QUANT
ENV	Pearson Correlation	1	**,637****	**,501****	**,937****
	Sig. (2-tailed)		**,000**	**,000**	**,000**
	N	111	**111**	**111**	**111**
SOC	Pearson Correlation	,637**	1	**,577****	**,825****
	Sig. (2-tailed)	,000		**,000**	**,000**
	N	111	111	**111**	**111**
GOV	Pearson Correlation	,501**	,577**	1	**,717****
	Sig. (2-tailed)	,000	,000		**,000**
	N	111	111	111	**111**
QUANT	Pearson Correlation	,937**	,825**	,717**	1
	Sig. (2-tailed)	,000	,000	,000	
	N	111	111	111	111

**. Correlation is significant at the 0.01 level (2-tailed).

Table 10: Correlation – Quantitativity variables

When we then compare the QUANT variable with the other independent variables, not coded with the content analysis, the correlations found in table 11 can be observed. The binary DISC variable indicating whether or not the company specifies has a high correlation with the quantitativity. Not strange

companies with a standalone report are bound to disclose more than those without. The correlation with the GRI and CSRHUB are lower but still significant. The importance of the quantitativity variable will therefore have to be tested with the use of regression.

		QUANT	DISC	GRI	CSRHUB
QUANT	Pearson Correlation	1	**,808****	**,751****	**,655****
	Sig. (2-tailed)		**,000**	**,000**	**,000**
	N	111	**111**	**111**	**42**
DISC	Pearson Correlation	,808**	1	**,660****	**,323***
	Sig. (2-tailed)	,000		**,000**	**,037**
	N	111	111	**111**	**42**
GRI	Pearson Correlation	,751**	,660**	1	**,631****
	Sig. (2-tailed)	,000	,000		**,000**
	N	111	111	111	**42**
CSRHUB	Pearson Correlation	,655**	,323*	,631**	1
	Sig. (2-tailed)	,000	,037	,000	
	N	42	42	42	42

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed)

Table 11: Correlation –Sustainability variables

The last correlation test performed is between the QUANT variable and the different proxies used for information asymmetry. Here we see significant correlations between all variables except between stock price volatility and analyst dispersion. The highest correlation found is between quantitativity and proportional bid ask spread, this gives the signal that QUANT will be more relevant in the regression for this proxy. Surprisingly the analyst dispersion measured by the standard deviation in recommendations is positively correlated to quantitativity. Also this proxy is negatively correlated with the others, indicating that they although the variable is computed they show a different aspect of information asymmetry than volatility or proportional bid ask spread. When computing the analyst dispersion for firms with at least two analysts following the correlation decreases to .275 albeit still significant. When taking firms with at least five following analysts this decreases further to .241. This shows that when there are more analysts

following the stock, the significance of the positive correlation between quantitativity and analyst dispersion decreases. When this statement is compared with figure 6 – indicating the link between size and quantitativity – we decide to proceed with the variable. This taking into account that during the regression analysis, size of the firm will be used as a control variable. Leaving the QUANT variable to test for further explanatory value regarding information asymmetry.

		QUANT	LN_PBASA	ADAVG	VOL C
QUANT	Pearson Correlation	1	**-,588****	**,313****	**-,270****
	Sig. (2-tailed)		**,000**	**,001**	**,004**
	N	111	**111**	**104**	**111**
LN_PBASA	Pearson Correlation	-,588**	1	**-,380****	**,348****
	Sig. (2-tailed)	,000		**,000**	**,000**
	N	111	111	**104**	**111**
ADAVG	Pearson Correlation	,313**	-,380**	1	**-,149**
	Sig. (2-tailed)	,001	,000		**,131**
	N	104	104	105	**104**
VOL C	Pearson Correlation	-,270**	,348**	-,149	1
	Sig. (2-tailed)	,004	,000	,131	
	N	111	111	104	111

**. Correlation is significant at the 0.01 level (2-tailed).

Table 12: Correlation – Information asymmetry proxies

7.3 Empirical Results

7.3.1 Hypotheses 1 and 2

The empirical model for hypotheses 1 and 2 is in line with Cormier et al. (2009) and Cheng et al. (2006) where the control variables size, volume traded, profitability, number of analysts, systematic risk (beta) and free float are used. Additionally, country dummies (DK, NL & SE) were created to test for significant differences between them. For both hypotheses the three different proxies of analyst dispersion were tested: proportional bid ask spread, volatility and analyst dispersion. The multiple/multivariate regressions are as follows:

H1 model 1a: $Analyst\ Dispersion_i = \beta_0 + \beta_1 Size + \beta_2 Volume\ traded + \beta_3 Profitability + \beta_4 Free\ Float + \beta_5 Systematic\ risk + \beta_6 Analysts + \beta_7 DK + \beta_8 NL + \beta_9 SE + \boldsymbol{\beta_{10} DISC}$

Based on this model, different regressions are made. For each type of information asymmetry regressions are run, with the independent variable being either DISC (disclosure, binary variable) or GRI (Global Reporting Initiative rating, ordinal variable). With this the regressions performed are with the same control variables as H1 model 1a, indicated by model number – dependent variable – independent variable:

- H1 model 1a – Analyst Dispersion – DISC
- H1 model 1b – Analyst Dispersion – GRI
- H1 model 2a – Proportional Bid Ask Spread – DISC
- H1 model 2b – Proportional Bid Ask Spread – GRI
- H1 model 3a – Volatility – DISC
- H1 model 3b – Volatility – GRI

Regression models for the second hypothesis are identical to the first with the exception of the test variable, replacing DISC/GRI with QUANT.

H2 model 1: $Analyst\ Dispersion_i = \beta_0 + \beta_1 Size + \beta_2 Volume\ traded + \beta_3 Profitability + \beta_4 Free\ Float + \beta_5 Systematic\ risk + \beta_6 Analysts + \beta_7 DK + \beta_8 NL + \beta_9 SE + \boldsymbol{\beta_{10} QUANT}$

- H1 model 1 – Analyst Dispersion – QUANT
- H1 model 2 – Proportional Bid Ask Spread – QUANT
- H1 model 3 – Volatility – QUANT

The aim of the first hypothesis is to test whether basic information on whether or not a company discloses on sustainability affects the information asymmetry.

The results of the multiple regressions can be seen below in table 13. Testing H1a, including all control variables, gives high multicollinearity for both DISC and GRI (a tolerance of ,154 and ,296 for size and volume traded). Therefore, for the subsequent regressions, the size variable has been left out, leaving 8

other control variables. As an example, the full regression table for H1b GRI has been placed in appendix 5. From the results none of the independent variables of GRI or DISC seem to be significantly adding to the prediction of the three information asymmetry proxies. GRI seems to be more descriptive, not surprising as it is a scale variable compared to the binary variable DISC. Only for the stock price volatility there seems to be an almost significant relationship with the GRI score. However the R square and adjusted R square seem highest for the proportional bid ask spread, signaling that this is a more complete model.

Hypothesis	Variable	Dependent	R Square	Adj. R Square	Beta	Sig	Tolerance	Min. Tolerance
H1 m1a	DISC	AD	0,289	0,189	0,020	0,888	0,549	0,282
H1 m1b	GRI	AD	0,289	0,189	-0,008	0,955	0,617	0,291
H1 m2a	DISC	PBAS	0,617	0,567	-0,050	0,616	0,569	0,273
H1 m2b	GRI	PBAS	0,618	0,568	-0,064	0,507	0,601	0,287
H1 m3a	DISC	VOL	0,263	0,167	-0,013	0,925	0,569	0,273
H1 m3b	GRI	VOL	0,289	0,196	-0,206	0,121	0,601	0,287

Table 13: H1 regressions –Models 1,2 and 3

When we take out the variable of amount of analysts the model turns into the one seen below, seven control variables left with the different dependent and independent variables left to test. This model is then used to test both the first and second hypotheses.

H1/2 models 4/5/6: $Information\ Asymmetry\ Proxy_i = \beta_0 + \beta_1 Volume\ traded + \beta_2 Profitability + \beta_3 Free\ Float + \beta_4 Systematic\ risk + \beta_5 DK + \beta_6 NL + \beta_7 SE + \boldsymbol{\beta_8 QUANT\ /\ GRI/\ DISC}$

What we can see below in table 14 is that multicollinearity decreases significantly and the tested variables become more relevant. Hypotheses 1 model 4a and model 5b change significantly compared to the previous regression; now the GRI variable has become significant at a level of 0.059. Whereas the other two have increased a lot compared to table 13, but are still not significant. The minimum tolerance level has also increased significantly from .273 to .452.

Hypothesis	Variable	Dependents	R Square	Adj. R Square	Beta	Sig	Tolerance	Min Tolerance
H1 m4a	DISC	PBAS	0,684	0,650	-0,120	0,113	0,629	0,445
H1 m5b	GRI	PBAS	0,688	0,660	-0,138	0,059	0,680	0,452
H1 m6b	GRI	VOL	0,293	0,230	-0,172	0,116	0,680	0,452

Table 14: H1 regressions – Models 4,5 and 6

Moving to the second hypothesis which uses the same control variables and information asymmetry proxies as the first. When we compute the original regression, with all 9 control variables we get a similar result as with the first hypothesis. There was again high multicollinearity between amount of analysts, size and volume traded. Also the R square of .263 and adjusted R square of .153 are not practical. When we then proceed with the adjusted regressions with 7 control variables, the results from table 12 appear. What we see is again low significance for the analyst dispersions, with a low beta and also a low explanatory R square value. However H2a and H2b seem to have become plausible, as for both the QUANT variable is significant at a 10% level.

Hypothesis	Variable	Dependents	Control Var.	R Square	Adj. R Square	Beta	Sig	Tolerance	Min Tolerance
H2 m4	QUANT	AD	7	0,238	0,151	0,039	0,771	0,606	0,499
H2 m5	QUANT	PBAS	7	0,686	0,658	-0,131	0,080	0,640	0,428
H2 m6	QUANT	VOL	7	0,297	0,217	-0,194	0,084	0,640	0,428

Table 15: H2 regression – Model 4,5 and 6

The full regression table of H2 model 2 can be found in table 17, here we see the QUANT variable has become significant at a level of ,080. The most significant variables are the volume traded and profitability in 2009 which is in line with common logic that liquid stocks have lower spreads. All variables except the country dummy variables are negative which is also in accordance with the hypothesis. The multicollinearity has been reduced compared to the 9 control variables regression.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-3,169	,230		-13,774	,000		
	BETA	-,086	,091	-,059	-,948	,346	,931	1,074
	FFMVAVG2010	-,405	,374	-,084	-1,084	,281	,598	1,671
	DK	,129	,206	,044	,624	,534	,728	1,373
	NL	,029	,188	,011	,152	,879	,744	1,344
	SE	,322	,246	,089	1,308	,194	,772	1,295
	PROF2009	-,018	,006	-,171	-2,794	,006	,965	1,036
	LN_VOAVG	-,356	,040	-,743	-8,837	,000	,511	1,955
2	(Constant)	-3,117	,229		-13,596	,000		
	BETA	-,077	,090	-,053	-,854	,395	,928	1,077
	FFMVAVG2010	-,323	,372	-,067	-,868	,388	,589	1,697
	DK	,141	,204	,048	,694	,489	,728	1,374
	NL	,031	,186	,011	,167	,868	,744	1,344
	SE	,264	,246	,073	1,073	,286	,758	1,319
	PROF2009	-,015	,006	-,150	-2,430	,017	,928	1,077
	LN_VOAVG	-,325	,044	-,678	-7,465	,000	,428	2,336
	QUANT	**-,012**	**,007**	**-,131**	**-1,769**	**,080**	**,640**	**1,563**

a. Dependent Variable: LN_PBASA

Table 16: H2 regression – model 2

Leaving out all the insignificant variables, i.e. the country dummies, systematic risk and relative free float leaves remaining the test variable QUANT and the two control variables of profitability in 2009 and volume traded in 2010. Results for all three variables are clearly significant with significant F Change for the QUANT variable at a level of ,006. The regression shows similar results as to the one with seven control variables. However, multicollinearity is lower with the adjusted R square only slightly lower decreasing from .658 to .650.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,797[a]	,635	,628	,73916	,635	93,094	2	107	,000
2	,812[b]	,660	,650	,71674	,025	7,797	1	106	,006

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-3,318	,138		-24,130	,000		
	LN_VOAVG	-,374	,028	-,783	-13,404	,000	1,000	1,000
	PROF2009	-,017	,006	-,163	-2,796	,006	1,000	1,000
2	(Constant)	-3,202	,140		-22,927	,000		
	LN_VOAVG	-,322	,033	-,674	-9,817	,000	,680	1,472
	PROF2009	-,014	,006	-,132	-2,293	,024	,963	1,039
	QUANT	-,017	,006	-,194	-2,792	,006	,665	1,505

a. Dependent Variable: LN_PBASA

Table 16: H2 regression – Model 2 revised

When we apply the same model to the QUANT variable testing for hypothesis 1a similar results can be found however at a slightly lower significance than with the QUANT variable. Also the adjusted R Square is lower than with second hypothesis.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,797[a]	,635	,628	,73916	,635	93,094	2	107	,000
2	,809[b]	,655	,645	,72253	,019	5,982	1	106	,016

Table 17: H1 regression – Model 2 revised

Comparing the two strongest results of the first and second hypotheses against each other gives the following results. When adding the QUANT variable to the regression consisting of control variables GRI, volume traded and profitability the test variable of QUANT comes in as almost significant. Within this GRI has a significance of ,404 compared to QUANT with a significance of ,123. This again might indicate that the quantitativity variable is more descriptive and related to the spread than the GRI variable.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,809[a]	,655	,645	,72253	,655	66,946	3	106	,000
2	,814[b]	,662	,649	,71775	,008	2,417	1	105	,123

a. Predictors: (Constant), GRI, PROF2009, LN_VOAVG

b. Predictors: (Constant), GRI, PROF2009, LN_VOAVG, QUANT

Table 19: H2 regression –GRI & QUANT comparison

From the regressions performed several conclusions can be made:

- DISC is not significantly related to any of the information asymmetry proxies, this variable is therefore *rejected*
- GRI has a significant negative relation to the proportional bid ask spread but none of the others and is therefore *partially supported*
- QUANT has a significant negative relation to the proportional bid ask spread and volatility but not analyst dispersion, it is therefore *partially supported*
- When comparing QUANT to GRI we see higher scores for the quantitativity variable in each test. To state that QUANT is therefore more related to information asymmetry than GRI is therefore *plausible*

7.3.2 Hypothesis 2a

Hypothesis 2a tests for moderating factors of size and analysts, and asks the following question: Is information asymmetry of larger firms more affected by quantitativity than that of smaller firms? For this another regression is run, the model summary + coefficients below (table 18) show a high

(Adjusted) R Square and shows that the F value of the added variable QUANT*SIZE is significant.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,840[a]	,705	,675	,69615	,705	23,615	9	89	,000
2	,846[b]	,716	,683	,68704	,011	3,376	1	88	,070

a. Predictors: (Constant), QUANT, SE, BETA, PROF2009, NL, FF, SIZE, DK, LN_VOAVG

b. Predictors: (Constant), QUANT, SE, BETA, PROF2009, NL, FF, SIZE, DK, LN_VOAVG, QUANT*SIZE

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-3,241	,227		-14,294	,000		
	ASIZE	-3,704E-8	,000	-,188	-2,767	,007	,722	1,385
	BETA	-,108	,086	-,075	-1,256	,212	,939	1,064
	FFMVAVG2010	-,487	,354	-,101	-1,375	,172	,612	1,633
	DK	,321	,199	,110	1,612	,110	,716	1,396
	NL	,136	,183	,051	,744	,459	,718	1,393
	SE	,076	,225	,022	,336	,738	,796	1,256
	PROF2009	-,021	,006	-,224	-3,627	,000	,872	1,147
	LN_VOAVG	-,279	,040	-,607	-6,965	,000	,437	2,291
	QUANT	-,005	,007	-,056	-,740	,461	,570	1,755
2	(Constant)	-3,164	,228		-13,902	,000		
	ASIZE	-1,089E-7	,000	-,551	-2,638	,010	,074	13,520
	BETA	-,111	,085	-,076	-1,299	,197	,939	1,065
	FFMVAVG2010	-,503	,349	-,105	-1,440	,153	,612	1,634
	DK	,342	,197	,117	1,738	,086	,714	1,401
	NL	,100	,182	,037	,549	,584	,710	1,409
	SE	,073	,222	,021	,329	,743	,796	1,257
	PROF2009	-,020	,006	-,214	-3,508	,001	,866	1,155
	LN_VOAVG	-,270	,040	-,586	-6,757	,000	,429	2,330
	QUANT	-,009	,007	-,097	-1,238	,219	,524	1,907
	AQUANTSIZE	1,792E-9	,000	,393	1,837	,070	,070	14,193

a. Dependent Variable: LN_PBASA

Table 18: H2a regression - QUANT*SIZE moderating factor

The results drawn from table 18 shows support for the hypothesis that size adds to the explanatory value of quantitativity. Replacing the QUANT*SIZE variable with QUANT*ANALYSTS with the same dependent and control variables we get the following model summary, shown in table 19.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,824[a]	,679	,651	,72143	,679	23,846	8	90	,000
2	,828[b]	,686	,654	,71842	,006	1,757	1	89	,188

a. Predictors: (Constant), QUANT, SE, BETA, PROF2009, NL, FFMVAVG2010, DK, LN_VOAVG

b. Predictors: (Constant), QUANT, SE, BETA, PROF2009, NL, FFMVAVG2010, DK, LN_VOAVG, QUANTANALYSTS

Table 19: H2a regression - QUANT*ANALYSTS moderating factor

Thus, testing the moderating effects of the amount of analysts following the company is rejected. The moderating effect of size, however, does have significant effects. The hypothesis that there are moderating effects on the link between quantitativity and information asymmetry is therefore partially supported, with the moderating effect of size, measured by revenue in 2010 fully supported.

7.3.3 Robustness check H1 & H2

To test for robustness of the analyses, two different additional analyses are made. First is to check the most significant regression (proportional bid ask spread) for the difference between months, and second to test the different quantitativity sub scores as the independent variable in the regression.

Although this is not an event study, the information asymmetry proxies were also created for each month. In addition to this the monthly control variables were also computed for relative free float and volume traded. Regressions with analyst dispersion as the dependent variable show no significant results for any of the months with R Square values of <0,1. Proportional bid ask spread however shows significant differences.

When performing the regression for every month of 2010, using the control variables: systematic risk, size, profitability, volume traded (month) and relative free float (month); test variable QUANT and dependent variable PBAS(month) we get the results presented in table 20. Again, here no clear signs of multicollinearity exist.

Dependents	R Square	Adj. R Square	Beta	Sig	Tolerance	Min Tolerance
PBAS JAN	0,807	0,793	-0,157	0,010	0,640	0,403
PBAS FEB	0,491	0,455	-0,246	0,012	0,663	0,397
PBAS MAR	0,599	0,572	-0,241	0,005	0,634	0,501
PBAS APR	0,789	0,775	-0,098	0,114	0,634	0,479
PBAS MAY	0,817	0,805	-0,068	0,236	0,646	0,446
PBAS JUN	0,819	0,806	-0,126	0,031	0,632	0,447
PBAS JUL	0,836	0,825	-0,082	0,132	0,648	0,390
PBAS AUG	0,821	0,809	-0,114	0,049	0,628	0,444
PBAS SEP	0,767	0,751	-0,212	0,002	0,626	0,433
PBAS OCT	0,560	0,529	-0,116	0,201	0,622	0,388
PBAS NOV	0,623	0,598	0,085	0,312	0,614	0,450
PBAS DEC	0,598	0,570	-0,148	0,092	0,628	0,403

Table 20: H2 regression – Model 2 robustness check: monthly

There are large differences in the significance of the QUANT variable. Also the R Square varies largely. The most striking observation, however, is that the values are much significant for certain months than others. This indicates that the impact of quantitativity on proportional bid ask spread differs significantly per month. In Figure 7 the link between the PBAS and significance level of the QUANT variable is made. The very significant values in the first three months of 2010 are combined with the highest average PBAS value of February. This value does not surprise as the spread is usually highest right before the earnings announcements.

When testing for correlation between monthly average PBAS and QUANT variable significance the correlation is -.080 which means that none exists. The major observation that can be made is that during the first three months of 2010 the QUANT variable is clearly more significant than during most others (with the exception of September). This could imply that for companies with a better quantitativity score really have lower bid ask spreads during the time when they are highest. The remainder of the PBAS

curve follows logical reasoning, where it peaks in February and then goes down gradually during the second half of the year.

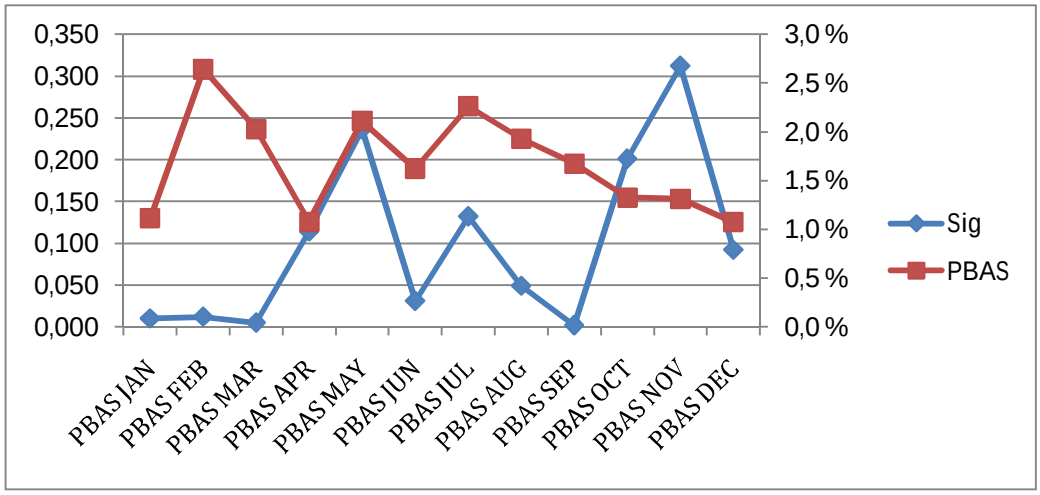

Figure 7: Monthly PBAS vs. QUANT significance

When the same regressions are performed with the monthly volatility as a proxy for information asymmetry less clear information is found. Only for May and June is the QUANT variable significantly related, here however the R Square is very low (,121 and ,119 respectively).

Overall, robustness is supported by the fact that although the QUANT has a stronger presence in some months than others, the average PBAS and average volume traded used in the original regressions seem to not be severely biased by specific months. On the contrary, taking the average values make the variable more robust – as its significance has been proven even with the low significance months May, October and November included in the variable.

The second check of robustness is to test whether the sub scores ENV, GOV and SOC make any difference. The most significant regression model *(H2 using the seven control variables as can be seen in table 15)* was performed replacing QUANT with the sub scores. Results of this, below in table 21, indicate that ENV is the only score that can significantly replace QUANT. An explanation may be that the standard deviation of the ENV variable is much higher than that of SOC or GOV (descriptive statistics in table 8 show std. dev. of 9 for ENV, 4 for SOC and 3 for GOV). This indicates that firms differentiate

by disclosing on environmental KPIs whereas social and governance disclosure is more similar among companies.

Hypothesis	Variable	Dependent	R Square	Adj. R Square	Beta	Sig	Tolerance	Min Tolerance
H2a	ENV	PBAS	0,686	0,659	-0,152	0,038	0,666	0,461
H2a	SOC	PBAS	0,672	0,643	-0,037	0,604	0,708	0,481
H2a	GOV	PBAS	0,671	0,642	0,002	0,972	0,781	0,515

Table 21: H2 regression – Model 2 robustness check: sub scores

The regression analyses were also performed for the non quantitative disclosure factors of integrated reporting, assurance, accounting methods or materiality statement (INT, ASS, ACC, MAT) and even though they all have negative coefficients, they did not add to the regression model significantly. Conclusions from this second robustness check are similar to the first, that the total QUANT score, even though dominated by the ENV variable is still significant. Another implication is that there is more disclosure diversification through environmental disclosure than the other two sub scores. Comparing this to figure 5, which shows the mean averages of the sub scores we see that there is definitely potential for further quantitativity in the disclosure regarding social and governance KPIs.

7.3.4 Hypothesis 3

The third hypothesis tests whether reports which are more quantitative score higher on ratings and indices than others. Although ratings and indices rank firms on similar indicators, again here some control variables should be taken into account. Firms with lower risk are often perceived as more sustainable too are those who are more profitable – more capital to invest into sustainability. This leads to an initial regression model:

H3 $CSRHUB_i = \beta_0 + \beta_1 Size + \beta_2 Profitability + \beta_3 Systematic\ Risk + \beta_4 Analysts + \beta_5 DK + \beta_6 NL + \beta_7 SE + \boldsymbol{\beta_8 QUANT}$

With this model applied we find again a low tolerance level for size (revenue 2010) and therefore continue with the other six control variables. What we find is a confirmation that when the sustainability disclosure is measured by

quantitativity it adds to the prediction of the score on CSRHUB. In other words, firms with a high QUANT score also have a high CSRHUB score.

Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	42,720	2,804		15,235	,000		
	BETA	1,569	1,425	,147	1,101	,279	,902	1,109
	DK	2,597	2,812	,145	,924	,363	,656	1,524
	NL	2,232	2,469	,145	,904	,373	,629	1,591
	SE	-1,469	2,984	-,073	-,492	,626	,728	1,373
	PROF2009	-,083	,090	-,134	-,921	,364	,768	1,301
	ANALYSTS2	,501	,114	,591	4,402	,000	,897	1,115
2	(Constant)	38,689	2,823		13,703	,000		
	BETA	1,188	1,273	,112	,933	,358	,893	1,120
	DK	2,099	2,505	,117	,838	,409	,653	1,530
	NL	1,356	2,213	,088	,613	,545	,618	1,618
	SE	-,946	2,658	-,047	-,356	,724	,725	1,379
	PROF2009	-,078	,080	-,126	-,981	,335	,768	1,302
	ANALYSTS2	,390	,108	,460	3,628	,001	,793	1,260
	QUANT	,218	,072	,384	3,039	,005	,798	1,253

a. Dependent Variable: CSRHUB

Table 22: H3 regression

Table 22 shows the regression analysis where the two main observations are the significance of both the number of analysts following the firm and the quantitativity score. It seems that firms with more analysts rating the stock get a higher rating as well as those with a higher score in quantitative disclosure.

To compare between independent variables and to check for robustness, the regression is also performed for all other disclosure variables. Table 25 shows the regressions for all the independent test variables available. We can see that QUANT and GRI are most significant, whether or not the firm has a dedicated report (DISC variable) does not seem to matter significantly. Also the accounting method and materiality statement seem to have no impact, this can be caused due to the low amount of firms supplying this information, only one case firm had a full materiality matrix and no firm fully disclosed the accounting methodology they use. Supporting the robustness of the QUANT

variable is to see that all sub scores have significant standardized coefficients, also the presence of an assurance statement (ASS) and if the report is integrated (INT) seem to add significantly to the CSRHUB score. This indicates that there is a possible link between the ratings of third parties and the way disclosure is presented – variables which do not represent the content of the report/disclosure.

Variable	R Square	Adj. R Square	Beta	Sig	Tolerance	Min Tolerance
QUANT	0,617	0,528	0,384	0,005	0,798	0,618
ENV	0,561	0,458	0,276	0,049	0,809	0,628
SOC	0,585	0,489	0,329	0,018	0,796	0,560
GOV	0,578	0,48	0,296	0,024	0,903	0,625
GRI	0,643	0,560	0,440	0,002	0,744	0,543
DISC	0,507	0,392	0,102	0,498	0,747	0,616
INT	0,559	0,456	0,291	0,052	0,712	0,547
ASS	0,613	0,523	0,394	0,006	0,732	0,546
ACC	0,503	0,387	0,069	0,623	0,851	0,620
MAT	0,527	0,417	0,183	0,194	0,836	0,600

Table 23: H3 regression – All disclosure variables

Conclusions that can therefore be drawn from the third hypothesis regressions are as follows:

- The question if quantitative sustainability disclosure positively impacts CSRHUB score is *supported* at a level of 1%
- The GRI variable is *supported* at a level of 1%
- The assurance variable seems to have significant impact on CSRHUB score and is therefore *supported* at the level of 1%
- The integrated reporting seems to have significant impact on CSRHUB score and is therefore *supported* at the level of 10%

7.3.5 Hypothesis 4

The fourth hypothesis focuses on the market value and cost of capital. Plumlee, Brown, & Marshall (2008) analyse the effect of environmental disclosure on these factors. In line with their research, beta and size are used as control variables for the cost of capital hypothesis. In adition to these, leverage measured by debt to equity ratio, profitability and free float are added. The dependent variable is the weighted cost of capital, data is

collected from Thomson Financial where the cost of capital is the sum of the weighted costs of debt, preferred stock and equity.

H4: $Cost\ of\ Capital_i = \beta_0 + \beta_1 Size + \beta_2 Beta + \beta_3 leverage + \beta_4 profitability + \beta_5 PBAS + \boldsymbol{\beta_6 QUANT}$

When the regression is performed the model summary states an R Square of ,232 and Adjusted R Square of ,160 the gap between the two indicates that there might be a significant variable missing which is often the case when there are a limited amount of observations. However this model shows the highest explanatory value. For quantitativity its standardized coefficient is negative – pointing to the fact that better disclosure gives lower cost of capital, however this is not significant at a level of ,226.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,463[a]	,214	,154	,06730	,214	3,547	5	65	,007
2	,482[b]	,232	,160	,06705	,018	1,491	1	64	,226

a. Predictors: (Constant), DER2010, REV2010, PROF2009, BETA, LN_PBASA

b. Predictors: (Constant), DER2010, REV2010, PROF2009, BETA, LN_PBASA, QUANT

Table 24: H4 regression – cost of capital

When we adapt the regression towards testing only for weighted average cost of equity or debt we get models that are slightly more explanatory for the cost of equity and significantly more explanatory for debt. The model summaries for both can be found in tables 25 and 26 below. The standardized coefficient for QUANT in the cost of equity regression is -,118 at a significance level of ,347 which therefore rejects the significance of this independent variable.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,494[a]	,244	,189	,06754	,244	4,458	5	69	,001
2	,504[b]	,254	,188	,06759	,010	,899	1	68	,347

a. Predictors: (Constant), DER2010, REV2010, PROF2009, BETA, LN_PBASA

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,494[a]	,244	,189	,06754	,244	4,458	5	69	,001
2	,504[b]	,254	,188	,06759	,010	,899	1	68	,347

a. Predictors: (Constant), DER2010, REV2010, PROF2009, BETA, LN_PBASA

b. Predictors: (Constant), DER2010, REV2010, PROF2009, BETA, LN_PBASA, QUANT

Table 25: H4 regression – cost of equity

The regression for cost of debt has a much higher Adjusted R Square at a level of ,315 stating that roughly 31,5% of the dependent variable is explained by the variables. Table 26 however reveals that the addition of the QUANT variable actually decreases the Adjusted R Square, also the significance of the variable itself does not add to the model.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,607[a]	,369	,324	,00508	,369	8,180	5	70	,000
2	,608[b]	,370	,315	,00512	,001	,152	1	69	,698

a. Predictors: (Constant), DER2010, REV2010, PROF2009, BETA, LN_PBASA

b. Predictors: (Constant), DER2010, REV2010, PROF2009, BETA, LN_PBASA, QUANT

Table 26: H4 regression – cost of debt

The comparison with the GRI regression shows similar results. Adjusted R Square values are slightly lower for all three dependent variables, cost of capital, equity, and debt. This is good in the way that we do not have any evidence that the higher the GRI score would be, the higher the cost of equity is for a firm. With these results in mind, we therefore cannot accept any of the costs of capital related hypotheses. The major observation made does not regard the quantitativity but the debt to equity ratio. DER2010 moves from a significantly negative value for weighted average cost of capital and equity to a significantly positive one for the cost of debt. Thus the higher the relative amount of debt, the higher the cost of debt for a firm. When however the cost of debt and equity are combined, the negative coefficient of equity over stems the positive one of debt. As this observation regards a control variable, it does not affect the verdict on the hypothesis.

8. INTERPRETATION & CONCLUSIONS

8.1 Summary and Conclusion

At the start of this report it was stated that *"The goal of this research is to prove that the quantitative aspect of sustainability disclosure is important for investors, and to test specific factors involved."* The steps undertaken to achieve this consisted of first defining the relevant aspects of quantitativity used to create the content analysis coding system. Second, to perform the content analysis on the selected cases. Third, to collect relevant financial data on these same cases, and the fourth step undertaken was to combine all this gathered information into an empirical analysis from which conclusions can be drawn.

Figure 8 below shows again the five hypotheses tested. The thickness of the indicating lines shows to what extent the hypotheses were proven. In the descriptive statistics we found a significant correlation between the disclosure scores and quantitative disclosure scores – this is therefore indicated by the green line between these two. All hypotheses were tested using the multivariate regression using the software tool PASW Statistics 18.

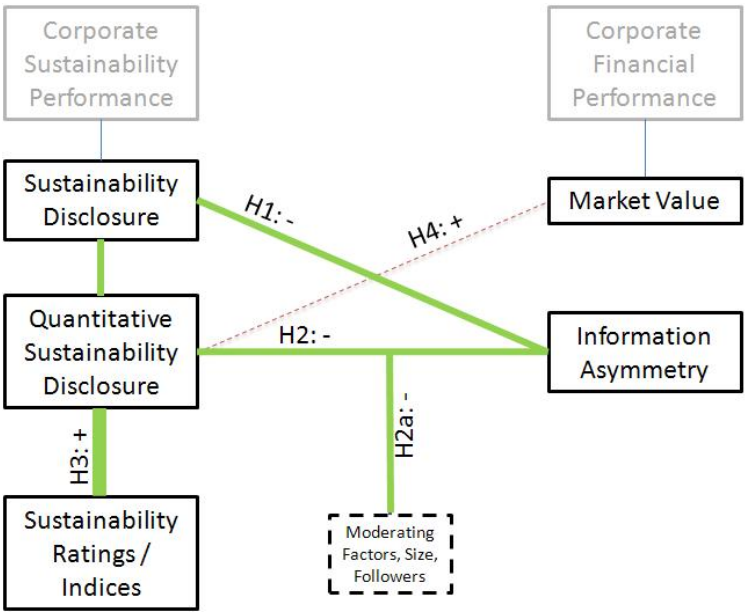

Figure 8: Hypotheses results

Through the different models used, hypothesis 1 turned out to be partially supported. Whether or not a firm discloses on sustainability did not have any link to information asymmetry. When however the binary variable of disclosure (1) or no disclosure (0) was replaced by the ordinal variable – the GRI score – from a scale from 0 – 4, a significantly negative relation was found between this variable and proportional bid ask spread.

The main hypothesis of this thesis was number two, whether quantitative sustainability disclosure had a significant negative relationship to information asymmetry. Of the three proxies used, two links turned out to be significant, proportional bid ask spread and stock price volatility. The similarity with the GRI variable was largely due to the way the coding system was set up. As the most complete disclosure guideline available at the time this research was performed, the majority of KPIs were based on the GRI G3 guidelines. Therefore there was a significant correlation between the two. Several results indicate however that regardless of the similarity the QUANT variable was more descriptive than the GRI variable.

1. QUANT was significantly related to two information asymmetry proxies, compared to GRI which was only significantly related to one.
2. Taking the sub score ENV instead of the total score QUANT significantly relates to PBAS at a 5% level compared to GRI which is only significant at a 10% level.
3. When comparing only the three significant independent variables, in the regression to predict PBAS, QUANT is more significantly related than the GRI variable.
4. If both the GRI and the QUANT variable are used simultaneously as independent variables, quantitativity is almost significant at a level of ,123 whereas GRI is much less close at a significance level of ,404.

The second hypothesis is further supported through hypothesis 2a, the moderating effect of size on the link between quantitativity and information asymmetry is significant. We can therefore state that the importance of quantitativity in sustainability grows as the size of a firm increases. Whereas

information asymmetry for smaller firms might be reduced more through other means such as firm to stakeholder engagement which is already provided by larger companies. As the moderating effect on number of analysts following the firm is not supported, the overall verdict on hypothesis 2a is partial support.

The third hypothesis had practical values in two areas, proving a link would show the importance of quantitativity in disclosure which at the same time was checked for robustness of the variables. Eight out of ten variables showed to have significantly positive coefficients in the model with CSRHUB as the dependent variable. Especially QUANT, GRI the assurance variable (ASS) and the integrated reporting variable (INT) had 1% levels of significance. From this we can state that quantitativity, high GRI rating, presence of an assurance statement, and having the report integrated all have impact on how third parties see the sustainability of a firm. The robustness element shows that the computed variables correlate with values allocated independently of this research. To test for market value, specifically the cost of capital which is a major source of the financial value of a firm, more regressions were performed. This link between disclosure and market value is vague as it is one step further then the information asymmetry between analysts.

The overall findings thus support the view that *quantitative* sustainability disclosure is more relevant than just (qualitative) sustainability reporting. The effects of having numerical data disclosed in its various forms can be seen back in the information asymmetry among investors and analysts.

8.2 Theoretical Contributions

This study builds upon previous studies in the fields of finance – namely information asymmetry, fields of communication – namely voluntary disclosure, and the field of corporate sustainability. The research shows similar results achieved by Petersen & Plenborg, (2006); Cheng et al. (2006); Yoon et al. (2011); Aerts et al. (2007) and Cormier et al. (2009), who all find

empirical evidence supporting the link between disclosure and information asymmetry.

It adds to the theory and talk that quantitative data on sustainability is more supportive for investment decisions than qualitative data. Cormier et al. (2009) already showed empirical support for this regarding quantitative human and social capital disclosure, now support can be added for quantitative sustainability disclosure. As the measurement system was based on GRI guidelines – the simplified version of sustainability disclosure was also tested. The positive association between these voluntary disclosures measured solely through the GRI rating therefore exists and can be used for future studies.

8.3 Managerial Implications

One of the major messages regarding the link between sustainability and investors is that the disclosure is not yet comparable enough for the financial services sector (WBCSD & UNEP FI, 2010). With this statement in mind, the empirical findings provide a solid statement for companies engaged in sustainability disclosure. Especially when they have the investors or the financial services sector in mind as a stakeholder, a different or some more advanced quantitative disclosure method would be optimal.

Regarding the sub scores of quantitative environmental, social and governance disclosure, companies already differentiate among each other based on environmental disclosure. However, when firms disclose on social and governance factors they are often on the same topics and comparable. Here there are possibilities to explore different ways of disclosure – e.g. regarding social disclosure on the difference/similarity in salary between men and women, none of the cases disclosed this.

When we compared the different disclosure variables with the third party ratings, the presence of an assurance statement and whether or not the report was integrated came up as relevant factors. For the assurance variable, well known financial auditors (so called Big 4 firms) received the highest

rating for assurance. This can be added to the incentive for firms to have a formal audit on their sustainability accounting. The integrated reporting factor also added to the explanatory value of third party score. With only a small amount of reports being fully integrated, but many firms starting to move into this direction – the findings support that integrated reporting is relevant for firms disclosing on sustainability. Having the report integrated shows the opinion of the firm, it is not just something the firm also does, it is a core commitment.

This core commitment is what the firm needs to convey to its stakeholders; have the report quantified ads to its usability and the way it will be adopted by the market.

8.4 Limitations and future research

As with any study several limitations exist, simultaneously they however create opportunities for possible future studies. One of the main opportunities would be to scale this research up from a cross sectional to a longitudinal research. Being able to compare quantitativity between different years of disclosure within the same firm would take out many of the external effects and could practically measure the impact of quantitativity.

Another limitation of this research was that the release dates of the reports were not taken into account. With the robustness check for the second hypothesis, focusing on the difference between months we saw a fairly large variation between the months. Especially the first three months of 2010 had significant impact on the proportional bid ask spread. It would have been possible to substitute these months with e.g. 3 months before release, 1 month before release, 5 days before - the release date - 5 days after, 1, 3 and 6 months after the release date. With this methodology an event study is created which would be able to give more insight into the impact of quantitative sustainability disclosure on information asymmetry and other possible variables.

Due to the choice of software analysis, PASW Statistics 18, testing each variable for endogeneity was not viable. Although variables were tested for robustness, this might have added to the verifiability of the data.

The analyst dispersion variable was based on analyst recommendations. As this has a limited ordinal scale (from one to five), the extent of dispersion was limited to the standard deviation between these observations. Another way to calculate this would be through forecasted earnings. This might have been a more representative way of measuring the dispersion between analysts. The fourth hypothesis could have also been tested again stock price or growth in stock price. For this to be tested an event study would however be optimal as the change in stock price could then be related to the exact day the information was released to the public.

For future research regarding sustainability disclosure and specifically the quantitative aspect, content could be defined even further. As the research found quantitative environmental disclosure specifically to have significant impact on dependent variables. It might be the case that certain environmental factors such as greenhouse gas emissions, waste disposal or which materials are used by the firms have different meanings for investors and analysts. Combining this with an event study or longitudinal research would give the most objective analysis on the impact of quantitative sustainability disclosure.

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10. APPENDICES

Appendix 1: GRI Indicators

Category	Subcategory
Economic	Economic
Economic	Market
Economic	Indirect Impact
Environmental	Materials
Environmental	Energy
Environmental	Water
Environmental	Biodiversity
Environmental	Emissions & Waste
Environmental	Products and Services
Environmental	Compliance
Environmental	Transport
Environmental	Overall
Labor	Employment
Labor	Labor
Labor	OHS
Labor	Training
Labor	Diversity
Human Rights	Investment & Procurement
Human Rights	Non-Discrimination
Human Rights	Freedom of association
Human Rights	Child Labor
Human Rights	Forces labor
Human Rights	Security
Human Rights	Indigenous Rights
Society	Community
Society	Corruption
Society	Public Policy
Society	Anti-Competitive Behavior
Society	Compliance
Product Responsibility	Customer HS
Product Responsibility	Labeling
Product Responsibility	Marketing Communications
Product Responsibility	Customer Privacy
Product Responsibility	Compliance

Appendix 2: Firm Categories

Code	Industry category
06	Extraction of crude petroleum and natural gas,
09	Mining support service activities,
10	Manufacture of food products,
11	Manufacture of beverages,
13	Manufacture of textiles,
17	Manufacture of paper and paper products,
19	Manufacture of coke and refined petroleum products,
20	Manufacture of chemicals and chemical products,
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations,
22	Manufacture of rubber and plastic products,
23	Manufacture of other non-metallic mineral products,
24	Manufacture of basic metals,
25	Manufacture of fabricated metal products, except machinery and equipment,
26	Manufacture of computer, electronic and optical products,
26	Manufacture of computer, electronic and optical products,
27	Manufacture of electrical equipment,
28	Manufacture of machinery and equipment,
29	Manufacture of motor vehicles, trailers and semi-trailers,
30	Manufacture of other transport equipment,
31	Manufacture of furniture,
32	Other manufacturing,
38	Waste collection, treatment and disposal activities; materials recovery,
41	Construction of buildings,
42	Civil engineering,
43	Specialized construction activities,
50	Water transport,
51	Air transport,
52	Warehousing and support activities for transportation,
53	Postal and courier activities,

Appendix 3: KPIs

Environmental		Social		Governance	
EN1	Material Used	LA1	Workforce by type, contract and region	SO2	Units analyzed for corruption
EN2	Material Recycled	LA2	Turnover by age, group & region	SO3	Employees trained on anti-corruption
EN3	Direct Energy Consumption (Total)	LA3	Benefits provided to full time employees	SO4	response to corruption
EN4	Indirect Energy Consumption	LA4	Percentage of workforce in union	SO5	Public policy positions & participation
EN5	Energy Saved	LA5	Minimum notice period significant changes	SO6	Total value of financial/in-kind contributions
EN6	Products that reduce energy	LA6	Health and safety unions	SO7	Legal actions on anti-competitive behavior
EN7	Initiatives to reduce indirect energy	LA7	Injuries, fatalities	SO8	Fines for non compliance
EN8	Total Water	LA8	Education etc. regarding diseases	GO1	Contribution To political parties
EN9	Water sources affected	LA9	OHS covered by union agreements	GO2	Controversy/dispute from legal procedures
EN10	Water recycled	LA10	Training per year per employee	GO3	Products withdrawn from market due to regulatory pressure
EN11	Locations in/close to biodiversity	LA13	Minorities	PR9	Fines for product non-compliance
EN12	Impact on biodiversity	LA14	Salary Ratio men to women per job category	LA11	Management training
EN13	Habitats protected or restored.	HR1	Investments that include human capsules	LA12	Performance reviews
EN14	Biodiversity impact strategies	HR2	Suppliers which had human rights screening	BO1	Board Selection
EN15	IUCN red list species	HR3	Human rights training	BO2	Board Structure
EN16	GHG emissions - Direct (Total)	HR4	Discrimination incidents	BO3	Executive Compensation
EN17	GHG emissions - Indirect	HR5	Right & support of unions	BO4	Audit fees
EN18	GHG reduction Initiatives	HR6	Risk of Child labor	BO5	Management Systems
EN19	Ozone-depletion	HR7	Risk of Compulsory Labor	IN1	Integrated reporting (max 5)
EN20	NOx, SOx,	HR8	Security trained wrt human rights	MA1	Presence of a materiality statement/matrix (max 3)
EN21	Water discharge (quality, destination)	HR9	Indigenous rights	AS1	Assurance statement (max 3)
EN22	Waste (type, disposal method)	SO1	Programs manage impact on communities	SA1	Description of accounting method (max 2)
EN23	Number & volume of spills	PR1	HS assessment of product		
EN24	Hazardous waste	PR2	HS Incidents compliance consumer products		
EN25	Effect of discharge water on biodiversity	PR3	Required labeling?		
EN26	Initiatives to mitigate environmental impact of products	PR4	Incidents of non-compliance of labeling		
EN27	Products reclaimed at end of lifecycle	PR5	Customer satisfaction of labeling		
EN28	Fines & non-monetary sanctions	PR6	Mrkt. communications compliance programs		
EN29	Transport	PR7	non-compliance incidents of marketing comm.		
EN30	Total environmental protection expenditures and investments	PR8	Customer privacy complaints		

Appendix 4: Correlation Matrix Regression H2, all control variables

		LN_PBASA	LN_REV2010	DK	NL	SE	FFMVAVG2010	PROF2010	BETA2010	LN_VOAVG	QUANT
Pearson Correlation	LN_PBASA	1,000	-,613	,206	-,173	-,026	-,522	-,282	-,122	-,770	-,578
	LN_REV2010	-,613	1,000	,273	-,033	,252	,341	,158	,132	,593	,539
	DK	,206	,273	1,000	-,342	-,203	-,093	-,058	,145	-,241	-,072
	NL	-,173	-,033	-,342	1,000	-,253	,039	-,001	-,013	,132	,087
	SE	-,026	,252	-,203	-,253	1,000	,007	,210	-,175	,192	-,055
	FFMVAVG2010	-,522	,341	-,093	,039	,007	1,000	,072	,037	,590	,414
	PROF2010	-,282	,158	-,058	-,001	,210	,072	1,000	,096	,175	,093
	BETA2010	-,122	,132	,145	-,013	-,175	,037	,096	1,000	-,072	,147
	LN_VOAVG	-,770	,593	-,241	,132	,192	,590	,175	-,072	1,000	,544
	QUANT	-,578	,539	-,072	,087	-,055	,414	,093	,147	,544	1,000
Sig. (1-tailed)	LN_PBASA	.	,000	,017	,038	,396	,000	,002	,105	,000	,000
	LN_REV2010	,000	.	,002	,368	,004	,000	,052	,087	,000	,000
	DK	,017	,002	.	,000	,018	,171	,275	,068	,006	,229
	NL	,038	,368	,000	.	,004	,346	,494	,448	,088	,186
	SE	,396	,004	,018	,004	.	,470	,015	,036	,024	,287
	FFMVAVG2010	,000	,000	,171	,346	,470	.	,231	,353	,000	,000
	PROF2010	,002	,052	,275	,494	,015	,231	.	,163	,036	,169
	BETA2010	,105	,087	,068	,448	,036	,353	,163	.	,232	,066
	LN_VOAVG	,000	,000	,006	,088	,024	,000	,036	,232	.	,000
	QUANT	,000	,000	,229	,186	,287	,000	,169	,066	,000	.

Appendix 5: H1a GRI Regression Table

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	,289	,033		8,779	,000		
	BETA	,000	,016	-,002	-,015	,988	,909	1,100
	FFMVAVG2010	-,013	,044	-,036	-,293	,771	,695	1,438
	DK	,052	,025	,247	2,058	,043	,730	1,370
	NL	-,002	,021	-,012	-,102	,919	,725	1,379
	SE	,015	,027	,068	,547	,586	,683	1,465
	PROF2009	-,003	,001	-,401	-3,578	,001	,837	1,195
	ANALYSTS2	-,003	,002	-,307	-1,684	,097	,316	3,167
	LN_VOAVG	,012	,008	,303	1,582	,118	,287	3,478
2	(Constant)	,284	,033		8,663	,000		
	BETA	-,005	,016	-,031	-,287	,775	,882	1,134
	FFMVAVG2010	-,006	,044	-,017	-,139	,889	,688	1,453
	DK	,058	,025	,276	2,292	,025	,713	1,402
	NL	,007	,022	,038	,304	,762	,677	1,477
	SE	,013	,027	,062	,502	,617	,682	1,466
	PROF2009	-,003	,001	-,407	-3,666	,000	,836	1,196
	ANALYSTS2	-,002	,002	-,218	-1,151	,254	,287	3,482
	LN_VOAVG	,013	,008	,317	1,671	,099	,287	3,486
	GRI	-,012	,007	-,206	-1,570	,121	,601	1,665

a. Dependent Variable: VOL C