The ESG Effect on IPO Underpricing

A study using textual analysis to explore the effect of ESG disclosure on IPOs first-day returns on Oslo Stock Exchange and Euronext Growth

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Master Thesis, Economics and Business Administration

Major: Financial Economics

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Acknowledgements

This thesis concludes our Master of Science in Finance at the Norwegian School of Economics. Writing this thesis has been both challenging and time-consuming, but above all, it has been a rewarding and interesting process with great learning outcomes.

First of all, we would like to express our gratitude to our supervisor Carsten Gero Bienz for his tremendous support, guidance and essential input during the writing process. We would also like to thank the respondents at Oslo Stock Exchange and Børsprosjektet for their quick and helpful replies and for providing us with the necessary documents used in our analysis. In addition, we would like to thank our friends and family for fruitful discussions and continuous support.

Norwegian School of Economics

Bergen, Spring 2022

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Abstract

This thesis examines the relationship between ESG disclosure and underpricing of IPOs on Oslo Stock Exchange and Euronext Growth. By employing textual analysis methods and an ESG dictionary, we construct a measure of ESG disclosure in IPO prospectuses for all companies. Thus, solving issues with sample selection biases due to lacking coverage from commercial rating agencies. We analyse a sample of 145 IPOs from January 2015 until December 2021 and find that a one standard deviation increase in our measure of Environmental disclosure leads to a 1.44% increase in first-day returns. The results suggest that Environmental disclosure increases investors' appetite for a stock in its initial offering and that Social, Governance and ESG disclosure in total does not significantly affect a stock's initial return. Hence, companies with relatively more Environmental disclosure tend to yield better first-day trading results.

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1   Introduction

Norway has been an active listing market for the past few years, with a wave of new and small green companies listed on Euronext Growth (Nilsen and Ree, 2021). Head of Pareto Securities, Christian Jomaas, states that investors have an increased appetite for and belief in green quality companies (Nilsen, 2021). Global ESG assets are on track to exceed $53 trillion by 2025, representing more than a third of the $140.5 trillion in projected total assets under management (Bloomberg, 2021). The combination of the increased importance of ESG friendly investments, a growing volume of IPOs in Norway, limited existing literature on the measurement of ESG disclosure and the effect of ESG on IPOs is the motivation behind this thesis.

We explore the effect of ESG-disclosure on underpricing of initial public offerings in Norway between January 2015 and December 2021. When analysing the effects of ESG on the stock market, researchers typically rely on ESG Scores from credible rating agencies like Sustainalytics or Refinitiv Eikon. However, the commercial rating agencies exclude most Norwegian companies, resulting in sample selection biases due to the exclusion of observations. Particularly, small and newly listed companies lack ratings, further undermining the use of these scores for analysis of Euronext Growth and IPOs. We propose to handle this by constructing an ESG disclosure measure for all companies using textual analysis. As far as we know, we are the first to use this method to examine and construct a measurement of companies' ESG disclosure in Norway.

We make extensive efforts to confirm the validity and relevance of the ESG disclosure measure. We find that a one standard deviation increase in ESG disclosure is linked with a positive effect of 0.71% on a company's first-day return. Although, the effect is not significant. Implying that ESG disclosure is efficiently priced in the IPO. We find contradicting results when running regressions on the disaggregated E, S and G scores. Environmental disclosure is significant on a 5% level, and a one standard deviation increase in Environmental disclosure is associated with a 1.44% increase in first-day returns. The calculated effect of Social- and Governance disclosure implies a decrease in first-day returns of −5.34% and −1.47%, although not significant.

Let's consider the methods and findings in more detail. To solve the problem of sample selection biases in papers examining the effects of ESG, we propose that one should do the footwork of creating a meaningful measure of ESG disclosure for all companies. Thus, ensuring that one does not limit research to a "special group" of companies selected by rating agencies. Based on a thorough review of existing literature, we decide to follow Loughran and McDonald (2011, 2013) to apply textual analysis in a financial context. They successfully prove the methodology in research on sentiment analysis of 10k-filings and IPOs and find that the level of uncertain text increases first-day returns. Our thesis replicate their method of computing a Term Frequency-Inverse Document Frequency (TF-IDF) measure, using a pre-determined ESG dictionary from Baier et al. (2020), who analyse ESG reporting in annual reports. Further, we translate the dictionary and slightly modify the translated version to ensure the capture of ESG disclosure in the IPO prospectuses written partly in Norwegian.

By applying textual analysis methods to the sample of prospectuses, information about the companies' ESG disclosure is extracted. Further, we adjust for document length and appearance to better measure a word's relevance by utilising a TF-IDF weighting scheme (Jurafsky and Martin, 2009; Kosmopoulos et al., 2008). We construct the aggregated, ESG, and disaggregated E, S, and G disclosure measures. This results in a more complete sample of companies when analysing the effect of ESG on the stock market, particularly in markets with lacking coverage from trusted commercial rating agencies. Thus, increasing the validity of analyses by reducing sample selection biases while investigating ESG effects on companies.

To explore whether ESG disclosure affects IPO underpricing, we first establish that underpricing is present in the Norwegian market during our time frame. This is done by computing the equally-weighted and value-weighted average first-day returns. We find an equally-weighted average underpricing of 13.2% and an average value-weighted underpricing of 9.01%. Ritter (2022) reports similar results, finding an average underpricing in Norway between 1984-2021 of 10.3%. Other studies on the Norwegian market for IPOs find that the first-day return varies between 4.3% and 17% (Banerjee et al., 2011; Westerholm, 2006; Sættem, 1997; Fjesme, 2011; Lidén, 2004).

Our primary model is a multiple OLS regression, using underpricing as the dependent variable and the ESG disclosure measures as our independent variables. To confirm our sample and enhance the validity of our model, we control for both firm- and offer characteristics. We base our models on multiple studies, e.g., Ibbotson and Jaffe (1975), who were among the first to confirm significant underpricing in the U.S market, as well as Ritter (2022), who has continuously updated the field of IPO underpricing and has built one of the largest existing IPO databases. To control our sample, we introduce a secondary model including commercially available ESG ratings as independent variables.

We find no significant effect for the aggregated ESG disclosure, supporting the result of numerous studies that examine the effect of ESG on the stock market. The majority of prior literature implies a neutral effect between Socially Responsible Investing (SRI) and stock market performance (Revelli and Viviani, 2015; Sargis and Wang, 2020). Although, Friede et al. (2015) in their investigation of 2200 studies found that 26.1% of studies in Europe showed a positive relationship, while 65.9% showed an insignificant one. Implying that there could be a positive relationship between ESG and returns in some regions. However, Giese et al. (2019) argues that the variation in findings across different studies could be a consequence of different methods and differences in databases.

This thesis provides multiple contributions to the existing literature. First, we aim to show how one can utilise textual analysis methods to create a meaningful measure of ESG disclosure in a financial context, particularly for markets with lacking ESG-scores from trustworthy sources. We successfully create a measure and confirm its relevance with extensive validation. The methods used are well established and frequently used in data science when analysing text to yield meaningful results. Next, we update the existing literature by confirming the presence of IPO underpricing in Norway. Further, we find that the isolated Environmental disclosure has a significant positive effect on underpricing in Norway. Another contribution is a Norwegian ESG dictionary that can be applied in textual analysis of documents written partly or entirely in Norwegian. As duplicates are filtered in the Norwegian version, we suggest using it simultaneously with the dictionary provided by Baier et al. (2020).

Textual analysis is a growing field within finance, and we hope that our thesis can serve as inspiration for future research utilising textual analysis methodologies in financial contexts. We particularly find it relevant to analyse the aftermarket performance of our sample of companies when there is enough historical data to yield meaningful results. We also suggest that future papers explore the effect of ESG disclosure using the Norwegian dictionary on other documents as there is a research gap on the topic in Norway.

2 Background

The purpose of this section is to illustrate the relevance of our thesis. First, by highlighting why the Norwegian market is interesting to analyse. Secondly, by explaining how ESG and the EU taxonomy has changed how firms disclose their ESG efforts to meet the increased demand set by both regulators and investors. Lastly, we present the commercial ESG rating process. This illustration gives context to why it is problematic to perform research on ESG with the currently available ratings.

2.1 The Rush of "Green Listings" in Norway

Oslo Stock Exchange and Euronext Growth has seen an enormous increase in activity in 2020 and 2021, with the amount of green companies[1] listed in Norway, nearly doubling from 28 to 54 from the end of 2020 until June 2021 (Nilsen and Ree, 2021). The surge of listings placed Norway as the number one exchange in Europe based on activity during the first half of 2021, with strong representation from the technology and ESG sector (Wiersholm, 2021). From 2016 until 2021, the share of green companies on Oslo Børs' stock exchanges increased from 2.10% to 16.67% and simultaneously, the accumulated market capitalisation increased from NOK 44.7bn to NOK 299.4bn (Fyksen, 2021; KPMG, 2021). The increasing popularity of ESG investments have caused Euronext and Nordea to create dedicateded ESG indices (Bamvik, 2022; Euronext Growth, 2022).

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[1]Companies classified as green by Oslo Stock Exchange.

2.2   ESG & the EU Taxonomy

ESG has become an increasingly important investment criterion for investors in the public market. In response to the climate crisis, the European Commission presented the Green New Deal and announced in January 2020 that the plan will gather at least € 1 trillion of sustainable investments from public and private sources (European Commision, 2020). Thus, businesses have a strong incentive to portray themselves as ESG friendly to attract capital. Disclosing ESG efforts could have a strong signalling effect, implying a commitment to engage in ESG promoting practices (Reber et al., 2021).

The changing dynamics regarding ESG from both a company and investor perspective are primarily due to the EU taxonomy. EU is one of the most active organisations in the effort to integrate ESG into business activities. In 2018 they issued the Action Plan on Sustainable Finance with the aim of "allocating the capital towards the investment which has the consideration of ESG factors on it; managing financial risk regards of climate change, environmental and social issues and encouraging transparency and long-term financial activities" (European Commision, 2018). The Action Plan has focused on sustainable finance as "the process of taking due account of environmental and social considerations in investment decision-making, leading to increased investments in longer-term and sustainable activities" (European Commision, 2018).

The changes affect how investors, financial institutions and firms handle ESG integration. First, the action plan emphasises the necessity of having the ESG taxonomy, providing unified definitions and a consensus of sufficient standards to clarify which activities are ESG-friendly. In addition, showing the necessity of creating standards for green financial products to guide investors toward ESG-friendly investments.

2.3   Commercial ESG Ratings

Evaluating a firm's ESG activities is usually both challenging and time-consuming. Thus, it is common to rely on commercial third parties, such as Sustainalytics and Refinitiv Eikon, who provide standardised ESG ratings. The process of constructing an ESG rating is complicated and requires extensive analysis of a firm. According to Dieschbourg and Nussbaum (2017), more than 300 analysts are employed by the two agencies, and they

analyse 400 ESG data points. The data originates from more than 1600 media sources that are retrieved daily from the government, news, NGOs and company disclosure in official statements.

Although ESG ratings from third parties are commonly used in studies, their reliability is controversial. ESMA (2021) published a letter to the European Commission where they raised questions about the quality of ESG ratings. Escrig-Olmedo et al. (2019)[2] show that rating agencies do not fully integrate sustainable principles in the assessment process. Compared with credit ratings, ESG ratings display low levels of correlation across providers, leading to issues down the investment value chain (Berg et al., 2019). As a result, ESMA (2021) states that the risk of capital misallocation and greenwashing[3] are high. At the same time, there are no appropriate legal tools to address these issues. This is further backed by a survey where 58% of executives admit that their company engage in greenwashing (Keeble, 2022).

It is also important to stress that ESG ratings are prone to biases. Doyle (2018) discuss that methodologies from ESG rating agencies have disclosed limitations and lack of standardisation; there are three biases of the ratings: (1) bias on the firm size; (2) geographical bias ; (3) the oversimplification of industry weight and company alignment. Thus, there is a lack of coverage of smaller, less known, and newly listed firms. Advisors, asset managers and clients need to acknowledge that there is a lack of uniformity in the research ratings or scores from the ESG research providers (Dieschbourg and Nussbaum, 2017). A gap in the research on ESG effects on the financial market in countries with "less important exchanges" with lacking ratings is created, such as Norway. Further, the existing research using these commercially available ratings will exclude a substantial amount of companies, resulting in problematic biases in the sample selection.

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[2]Escrig-Olmedo et al. (2019) research is supported by the European Union's Horizon 2020 Research and Innovation Programme.

[3]The phrase "greenwashing" evokes painting something "green" or environmentally friendly and describes exaggerated and misleading claims that suggest a company or country are stewards of the environment without real action (Henderson, 2021).

3 Methodology

The following chapter describes the applied textual analysis and underpricing methods used in our thesis. To assess the objective of our thesis, we first define and explain textual analysis and its usefulness in a financial context. Further, we describe the function used for computing the ESG disclosure measure. At last, we define and explain the methods for calculating IPO Underpricing.

3.1 Textual Analysis in Financial Contexts

Textual analysis can be considered a subset of qualitative analysis, most frequently falling into the categories of either targeted phrases, sentiment analysis, topic modelling, or measures of document similarity (Loughran and Mcdonald, 2016). Dovring (1954) documents the use of textual analysis as far back as the early 1600s, when hymns were examined for word choices that threatened a religious group. Disciplines with a long history in computational linguistics have rich methodological toolboxes used to assess collections of documents and extract information, beginning in the 1950s with the invention of the computer. However, textual analysis is an emerging area in accounting and finance, and as a result, the corresponding taxonomies are still somewhat imprecise (Loughran and Mcdonald, 2016).

There has been an increased usage of textual analysis methods in academia (Rohrer, 2021). Luhn (1957) was a pioneer in the field and made extensive contributions by establishing a standard for the use of encoding to extract useful information from libraries of documents automatically. Investors and asset managers can utilize textual analysis methods to make predictions on movements in the stock market (Schumaker and Chen, 2009). For instance, Twitter is increasingly used as a communication platform for CEOs, politicians, and companies, such as Elon Musk, Donal Trump, and Tesla. Their tweets impact the price of stocks, indicating that one can profit from automated trading algorithms processing this information using sentiment analysis (Mukhtar, 2020). Thus, there is potential to use the methods to make investment decisions based on analysis of contemporaneous news, company filings or tweets.

3.2   Term Frequency – Inverse Document Frequency

Jurafsky and Martin (2009) note that term weighting "has an enormous impact on the effectiveness of a retrieval system". A weighting method is therefore needed to ensure appropriate measurement of ESG disclosure. We decide to follow Loughran and McDonald (2011), who utilize a term weighting scheme called Term Frequency-Inverse Document Frequency (TF-IDF) in their paper on sentiment analysis in 10k-reports. The equation consists of two elements: (1) Term Frequency (TF) which is a measure of the frequency of a term in each document, and (2) the Inverse Document Frequency (IDF), which is a measure of whether the term is common or rare in our sample of files. A rare term will be regarded as more important and hence given a higher IDF score than a common term.

$$
TF\text{-}IDF_i^{ESG} = \sum_{\omega}^{\Omega} w_{\omega,i}^{TF\text{-}IDF} \text{ where } w_{\omega,i}^{TF\text{-}IDF} = \begin{cases} \frac{1+log(TF_{\omega,i})}{1+log(a_i)} * log\frac{N}{DF_\omega} & \text{if } TF_{\omega,i} \geq 1 \\ 0 & \text{otherwise} \end{cases}
$$

$$(3.1)$$

Ω is the total number of words in the dictionary, $TF_{\omega,i}$ indicates the term frequency of word ω for firm i. a_i is the average word frequency for firm i and DF_ω is the number of documents in the sample in which word ω appears, and N represents the total number of documents.

3.3   Measuring Underpricing

IPOs tend to experience a positive return on the first day of trading, indicating that the offering price is set too low relative to the market demand (Berk and DeMarzo, 2014). On the contrary, if the demand is low, the first-day closing price will be closer to the offer price (Santos, 2017). Loughran and Ritter (2002) find that the average amount left on the table because of underpricing between 1990 and 1998 was $27 billion, with the average first-day return doubling to 15% from 7% in the 1980s. Furthermore, Ljungqvist (2007) find that in 1999 and 2000, during the peak of the dot-com bubble, it was left an average amount of $62 billion on the table.

Following existing literature, we measure IPO underpricing as the percentage change from the offer price to the closing price at the end of the stock's first trading day, also known as the "first-day return" (Ritter and Welch, 2002; Loughran and Ritter, 2004). Underpricing is defined in Equation 3.2. The initial return of firm i is calculated using the offer price and unadjusted closing price. It is unnecessary to adjust the initial return for market movements as these are small compared to the average initial return (Beatty and Ritter, 1986). This is further backed by Burrowes and Jones (2004), who argue that market movements are less of a problem over a short time period. Thus, underpricing is given as:

$$Underpricing_i = \frac{Closing\ Price_{i,1} - Offer\ Price_{i,0}}{Offer\ Price_{i,0}} \quad (3.2)$$

Further, we adjust all offer sizes and market capitalizations to Norwegian krone (NOK) using the exchange rates at the date of offering to eliminate currency effects. To ensure a correct basis for comparison, we adjust the offer size and market capitalization using consumer price index values gathered from the currency calculator at Norges Banks website (Norges Bank, 2014).

$$Adj.Offer\ Size_i = \frac{Offer\ Size_i}{1 + CPI\ Deflator_i} \quad (3.3)$$

$$Adj.Market\ Capitalization_i = \frac{Market\ Capitalization_i}{1 + CPI\ Deflator_i} \quad (3.4)$$

Next, we compute the average equally-weighted and average value-weighted first-day returns. Due to more pronounced anomalies for small firms, the equally weighted first day returns tend to be higher than value-weighted first-day returns (Schöber, 2008). The average equally weighted return of the initial sample s is calculated using Equation 3.5, where n_s represents the sample size with equal weights assigned to each firm. To ensure detection of potential effects of underpricing between IPOs of different sizes, we compute the value-weighted return using Equation 3.7. The weights are given by Equation 3.6 and assigned to the firms based on their relative inflation-adjusted offer size.

$$Underpricing_s^{EW} = \frac{1}{n_s} \sum_{i=1}^{n_s} IR_i \tag{3.5}$$

$$w_i = \frac{Adj.Offer\ Size_i}{\sum_{i=1}^{n_s} Adj.Offer\ Size_i} \tag{3.6}$$

$$Underpricing_s^{VW} = \sum_{i=1}^{n_s} w_i * IR_i \tag{3.7}$$

4 Data

The following section describes our sample of IPO prospectuses and the creation of variables used in our analysis. The dataset is constructed with the purpose of answering whether ESG disclosure affects the initial underpricing of Norwegian listings in our time period. We first explain the process of obtaining and sorting the prospectuses. Next, the process of constructing and validating the ESG disclosure measure is explained. Lastly, we introduce the control variables and present summary statistics.

4.1 Retrieving the IPO Prospectuses

A public database containing IPO prospectuses in Norway does not exist. Thus, we reach out to Oslo Stock Exchange for an archive with former listings. We get access through Børsprosjektet at NHH and receive a folder containing 185 pdf documents from Jan. 2015 until Dec. 2021, including a few duplicates and non-IPO files that are removed. Next, we cross-check the folder with listing overviews from Oslo Stock Exchange and find that some prospectuses are missing. Thus, we download the missing prospectuses from company websites. Further, information on the IPOs deal characteristics are retrieved from Amadeus 3.0 and the Bloomberg Terminal. For companies with insufficient information, we manually search the internet and inspect the prospectuses to gather data and ensure a complete dataset. We remove companies lacking critical deal characteristics and companies that simply filed a new prospectus when moving from one exchange to another. After cleaning the data, the sample consists of 145 IPO prospectuses.

4.2   ESG Dictionaries

Following Loughran and McDonald (2011, 2013), a dictionary is utilised in the construction of the TF-IDF score. We use a predefined dictionary from Baier et al. (2020), who constructed an ESG wordlist based on 10-K filings and ESG proxy statements using textual analysis. For a term to be included in the dictionary, it must be used in an ESG context in most of its occurrences and appear in at least 5% of all reports. The dictionary has a total of 482 terms, consisting of 55 environmental terms, 151 social terms, and 276 governance terms. We provide the complete dictionary in Appendix A0.5.

We discover multiple files containing significant parts written in Norwegian during an inspection of the prospectuses. Instead of removing the files, we construct a second dictionary based on a translation of the dictionary provided by Baier et al. (2020) to ensure capture of the Norwegian disclosure. During the translation, we carefully consider each word to ensure its relevance in a Norwegian ESG context. To avoid double-counting, words written identically in both languages (duplicates) are removed in the translated version. In addition, we add specific Norwegian ESG terms not used in English. The complete Norwegian dictionary is included in Appendix A0.6.

Using the count of Norwegian terms directly can be problematic due to the second element of the TF-IDF equation. Since most documents are written entirely in English, Norwegian words are in general rare. Thus, Norwegian words will be perceived as too rare in the computation of IDF. To correct for this, words in the Norwegian dictionary are matched with their English equivalent. This is done to translate the count of all terms into a common language. For instance, "bærekraftig" only appears in 6.80% of documents, while it's English equivalent "sustainable" appear in 64.62%, resulting in a higher IDF score for "bærekraftig", even though both terms are used to express the companies' same ESG efforts. Matching them solves this problem by giving the terms a combined score.

4.3   Parsing the IPO Prospectuses

As most studies using textual analysis in finance, we use a bag of words method that requires parsing the IPO prospectuses into vectors of words and word counts. To do this, we create a corpus[4] containing the entire sample. Next, we create a term-document matrix (TDM) and clean unnecessary information from the data by removing punctuations, symbols, numbers and stopwords. These take up a lot of space in documents, with stopwords commonly being among the most frequent words in documents (Manning and Schutze, 1999; Loughran and Mcdonald, 2016; Baier et al., 2020). Thus, removal reduces the computational time drastically. At last, since R-studio is case sensitive, all characters in the documents are transformed to lower case to ensure correct matching with the dictionary. The completed TDM includes all words from the dictionary in columns, documents in rows and the count of each ESG word for each document in the matrix.

During the creation of the TDM, we discover unexpectedly low values for some companies. Using the PDF-tools package in R-studio, we read through the prospectuses and discover some unreadable files. Closer inspection reveals unreadable parts in most files, often sections from annual reports containing information about ESG activities. Thus, we use optical character recognition (OCR) to transform all pages of all documents into readable PDFs to ensure that our code will read all pages in the prospectuses.

4.4   Distribution of ESG Words

We apply textual analysis methods and count the relevant words across our files before sorting them into categories. Figure 4.1 shows a word cloud consisting of the top 20 words from the E, S and G categories. The colours represent the different categories, with the colours green, orange and blue, respectively. The size of the words indicates the number of times the word occurs in our PDF sample. Social and Governance terms dominate the word cloud, indicating that most words mentioned in the prospectuses are from the respective categories. This makes sense due to the nature of including particularly governance disclosure in an IPO prospectus and is consistent with findings on ESG disclosure in 10-K filings from Loughran and McDonald (2011).

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[4]A corpus is similar to a library or a database, consisting of collections of documents providing easy access to them when doing further analysis.

Figure 4.1: Word Cloud of the Most Frequently Used ESG Words
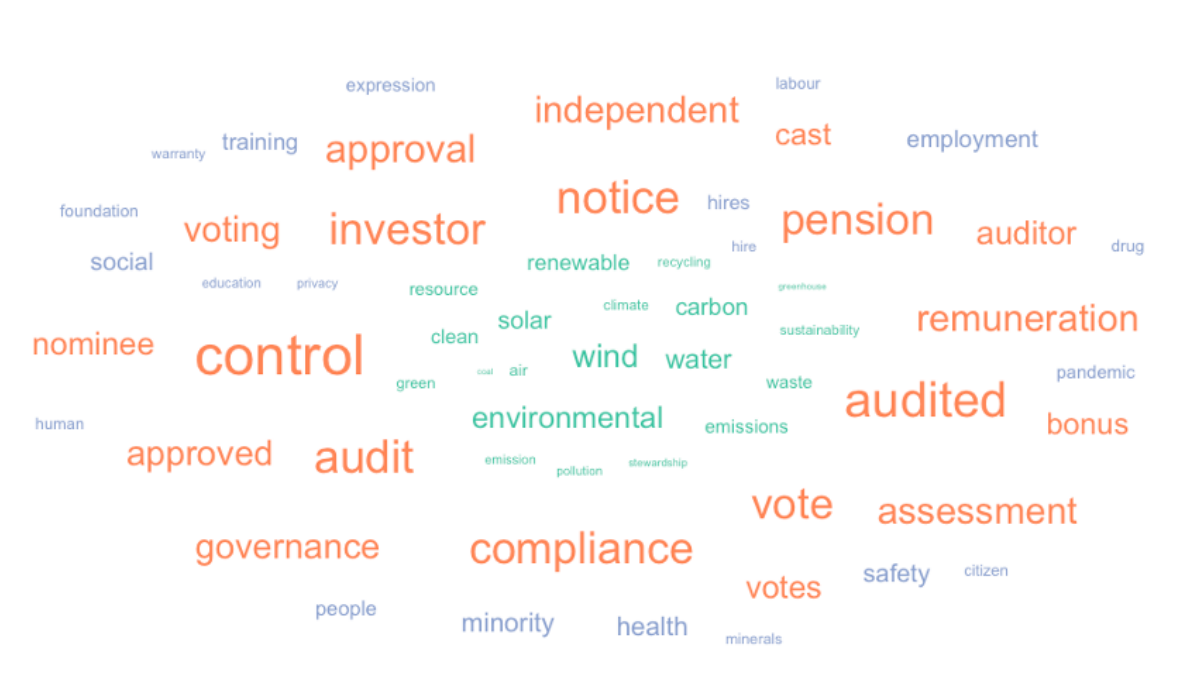
This figure shows the most frequently used ESG words across the total sample of IPO prospectuses. The words originate from the dictionary created by Baier et al. (2020), provided in Appendix A0.5. The figure includes the 20 most frequently used words from each of the Environmental, Social and Governance dimensions which are coloured green, orange and blue, respectively. The size of the words illustrates the Term Frequency (TF).

A classical tripwire in the classification of words is that the counts tend to follow a power of law distribution with a few words dominating it, referred to as Zipf's law (Manning and Schutze, 1999). This is visualised in Figure 4.2, where the relative frequency of appearance of ESG words are plotted[5]. Looking at the graph, we see that our count follows the expected distribution, and the top 30 words relative to all 482 words in the dictionary amount to 49.11% of all ESG words in the sample. Since word distributions in general follow Zipf's law, Loughran and Mcdonald (2016) suggests that the proportions of words with the highest frequency of appearance in research that use word classification should be displayed. This allows for the identification of possible misclassifications due to the author's subjective decisions (Baier et al., 2020).

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[5]Relative frequency of a word is computed by deviding the total count for a given ESG word on the total count of all ESG words.

Figure 4.2: Percentage Share of Total ESG Words for the Most Frequent Words
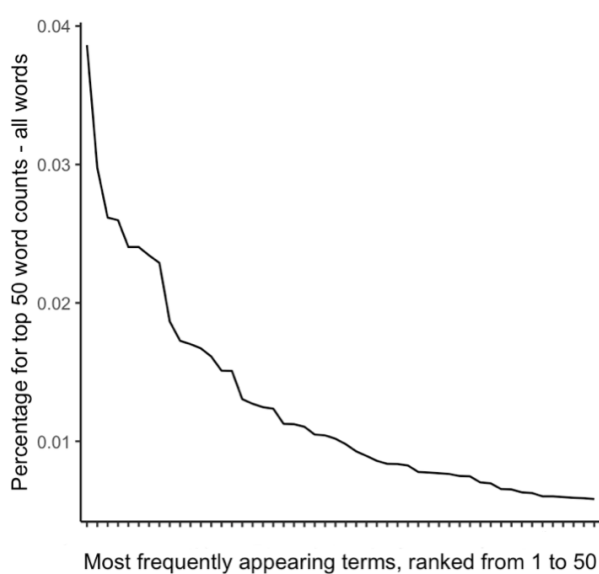
This figure shows the share of total ESG words for the 50 most frequently used ESG words across the total sample of IPO prospectuses. The words originate from the dictionary from Baier et al. (2020) and the Norwegian dictionary provided in Appendix A0.5 and A0.6.

4.5   Creation of ESG Disclosure Measure

Using Equation 3.1 we compute aggregated and disaggregated ESG measures for all companies in the sample. The word "control" is mentioned 5021 times, while the word "biodiversity" only appears 15 times. The TF element of the equation implies that "control" will receive a higher weight than "biodiversity". Although, it is unlikely that "control" is 335 times (5021/15) more important. We perform the log transformation of term frequency to ensure better control of the impact of highly frequent words (Loughran and McDonald, 2011).

The IDF element of Equation 3.1 adjusts the TF based on the number of documents a term appears in. For instance, "control" is mentioned in 145 of 145 documents, and "biodiversity" is mentioned in 8 of 145. The equation decreases the weight of "control" and increases the weight of "biodiversity" due to its rarity, implying that a rare term should be regarded as more special (i.e. important) than a common term (Jurafsky and Martin, 2009; Loughran and McDonald, 2011). Further, the TF-IDF weights for each term are grouped by the categories E, S and G. Summing the categories individually for each company yields the disaggregated ESG disclosure measures. The disaggregated measures for each company are then summed, yielding an aggregated ESG disclosure measure.

Figure 4.3: Development in ESG Disclosure Measures From 2015 until 2021
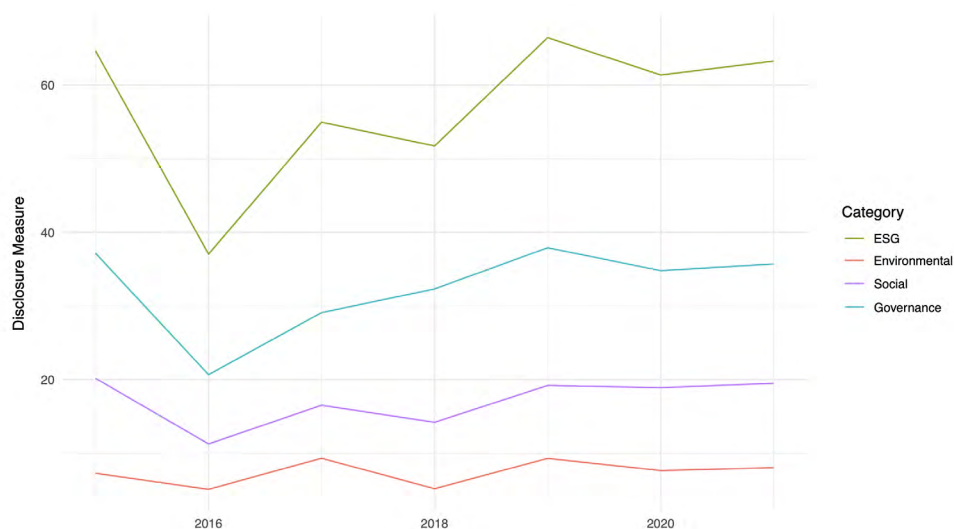
This figure shows the development in aggregated and disaggregated TF-IDF ESG disclosure measures across our sample of IPO prospectuses. The figure displays the mean of the individual measures for the years 2015 until 2021. The individual measures, ESG, Environmental, Social and Governance are coloured green, orange, purple and turquoise, respectively.

Figure 4.3 presents the development of the average ESG disclosure measures from 2015 until 2021. ESG disclosure has been consistent throughout our sample period. There is a dip in 2016 mostly driven by a decrease in governance- and social disclosure, followed by a slight increase the following years. Although there seems to be a trend from 2016 to 2021, the first two years consist of only five firms. Thus, more data is needed to conclude on ESG disclosure trends.

4.6   Validating the Context of ESG Disclosure

In textual analysis, there is a critical transformation that must take place when moving from a collection of terms to extracting the information conveyed by these terms (Fairclough et al., 2003). The meaning of the terms can be ambiguous, and depends on the context of a sentence, document, or collection, in addition to when and by whom it was written (Loughran and Mcdonald, 2016). Hence, we need to validate the context of our selected words to confirm that the ESG disclosure measure is meaningful and reflects actual environmental, social and governance efforts. For instance, if "control" refers to a firm's controlling interest in subsidiaries, we would capture the firm's ownership and market strategy. Contrary, if the word refers to internal control systems or control mechanisms, we capture the ESG efforts.

To ensure the validity of our ESG measure, we select one of the most frequent words from each ESG category in our sample. The words "sustainable", "safety", and "control" are broadly used. We construct a Key Words In Context (KWIC) table to analyse the adjacent words surrounding our selected keywords. KWIC tables provide insights into the context of the word's appearance and help determine the semantics of a given word (Weber, 1990). The table is constructed by counting the most frequent words surrounding the selected keywords. We include the three words immediately before and after the appearance of the keyword. A summary of the top ten most frequent words surrounding the selected keywords is provided in Table 4.1.

Table 4.1: Key Word in Context Table for Three Selected ESG Words

Sustainable		Safety		Control	
Left Context	Right Context	Left Context	Right Context	Left Context	Right Context
environmentally	development	health	environment	change	company
circa	energy	food	management	internal	group
strong	goals	environmental	issues	beyond	including
UN	solutions	product	regulations	group	management
united	growth	quality	quality	company's	surveillance
dividend	chemicals	environment	environmental	outside	financial
secure	business	norwegian	health	group	clause
cash	production	respect	efficacy	house	systems
create	profitability	international	standards	common	relevant
efficient	future	focus	matters	date	subsidiary

This table provides a summary from a Key Word In Context (KWIC) analysis where we show the ten most frequent words surrounding the selected keyword for the left and right context. The words are ordered descendingly by frequency. E.g., out of three words in the left context of the word "sustainable", counting for all firms in total, the most used word is "environmentally".

Table 4.1 shows that "environmentally" and "development" are the most frequent words surrounding "sustainable". Thus, we would expect "sustainable" to be used in the context of a firm's effort to ensure environmentally friendly and sustainable development. To examine whether the word "sustainable" actually refers to the firm's efforts, we select a sample of three firms and extract paragraphs from their prospectuses that mention "sustainable". The paragraphs with context analysis are provided in Table 4.2. For instance, in Panel A, Aker Horizon refers to their commitment to United Nations (UN) sustainability goals, Norsk Solar to their goal of establishing solar energy as a clean source of energy, and Cambi to their vision of establishing sustainable biogas and biofuels.

Further, we employ the same method to validate the context of "safety" and find that "health" appears in both the left and the right context. Other common words are "quality", "products", and variants of "environment". This indicates that the word "safety" is used in the context of a safe and healthy work environment, but also safe products of high quality. The paragraphs from Panel B of Table 4.2 confirm that the companies Akobo Minerals and Elkem use the words in the context of improving safety standards and that Ultimovacs ensures the safety of products.

Lastly, we inspect the word "control", which initially seems to have a more ambiguous usage. The word is used to discuss both "internal" control like "management", "change", "systems", and "financial", but also external control like "subsidiary". This implies that the context of control could be related to both Governance and other dimensions. However, when inspecting the prospectuses in Panel C of Table 4.2, we confirm that the companies use the word in a satisfactory context.

**Table 4.2:** Excerpts From the IPO Prospectuses of Various Firms

Company

Panel A: Keyword = Sustainable

Aker Horizons 20.03.2019	" The Company's investment mandate is grounded in eight of the United Nations Sustainable Development Goals ("SDG") and provides significant flexibility to build a portfolio of leading planet-positive companies in established and emerging industries to deliver sustainable and long-term value creation via active ownership."
Norsk Solar 2021.04.19	"The Company's vision is to improve our future by establishing solar power as a competitive and sustainable source of energy . The Company's strategy is to pursue an integrated business model, and develop, construct, own and operate utility-scale photovoltaic solar power plants offering attractive returns."
Cambi 2021.02.09	"The EU Energy System Integration Strategy, as currently envisioned, will establish incentives for the use of agricultural residues to produce sustainable biogas and biofuels, which could unlock the potential of sustainable biomass and biofuels, green hydrogen, and synthetic fuels . This could increase the generation of renewable electricity in the future."

Panel B: Keyword = Safety

Akobo Minerals 2021.07.13	"As we operate in such a remote part of the world, we have a continuous focus on the most up-to-date safety equipment, systems and modern conveniences at site , ensuring a safe workplace for our staff."
Elkem 2018.03.09	"Elkem's production and maintenance activities involve interaction with large quantities of raw materials, hazardous chemicals, powerful machinery and very high temperatures giving the potential for harm and damage. Substantial resources are therefore used to understand and control risks that may cause injury or illness. Elkem has a zero-harm philosophy regarding health and safety and gives prevention of injury and illness first-priority in its operations."
Ultimovacs 2019.05.20	"The aim of early phase studies is to prove that the new drug can safely be given to people22, to determine a safe dose range and dosing schedule, identify side effects and detect early evidence of effectiveness. The aim may also involve demonstrating some biomarker, surrogate or clinical outcome that could be considered as "proof of concept" and the studies can be used to demonstrate safety when combining the study drug with another drug ."

Panel C: Keyword = Control

Ørn Software 2021.03.26	"The Group relies upon industry accepted security measures and technology such as access control systems to securely maintain confidential and proprietary information maintained on its IT systems, and market standard virus control systems ."
Meltwater 2020.12.03	"In order to maintain and improve the effectiveness of its internal control over financial reporting , the Group has expended, and anticipates that it will continue to expend, significant resources, including acccounting-related costs and significant management oversight."
Komplett Group 2021.06.08	"The Group aim to further develop its risk assessments and engagement with its supply chain related to social and environmental issues. This includes strengthening the Group's internal knowledge and control mechanisms related to these topics , especially within the use of chemicals and hazardous materials and waste."

This table shows paragraphs from the IPO prospectuses from nine firms. The keywords we have searched for are "sustainable", "safety" and "control". The keywords are highlighted in yellow and the context in grey. The date below each firm name is the date of the IPO prospectus filing.

4.7   Comparing the ESG Disclosure Measure With Commercial ESG Ratings

To further understand our measure of ESG disclosure, we compare the measure with ESG scores from Refinitiv Eikon and Sustainalytics. The score from Refinitiv measures the company's ESG performance based on verifiable reported data in the public domain (Refinitiv, 2022). The Sustainalytics score is an ESG Risk Rating, offering clear insights into company-level ESG risk by measuring the size of an organisation's unmanaged ESG risk (Sustainalytics, 2022). We display the relationship between the Sustainalytics ESG Risk Score and our ESG disclosure measure to the left in Figure 4.4 and the relation to the Refinitiv Eikon ESG score to the right.

Figure 4.4: Relationship Between our Disclosure Measure and Commercial Ratings
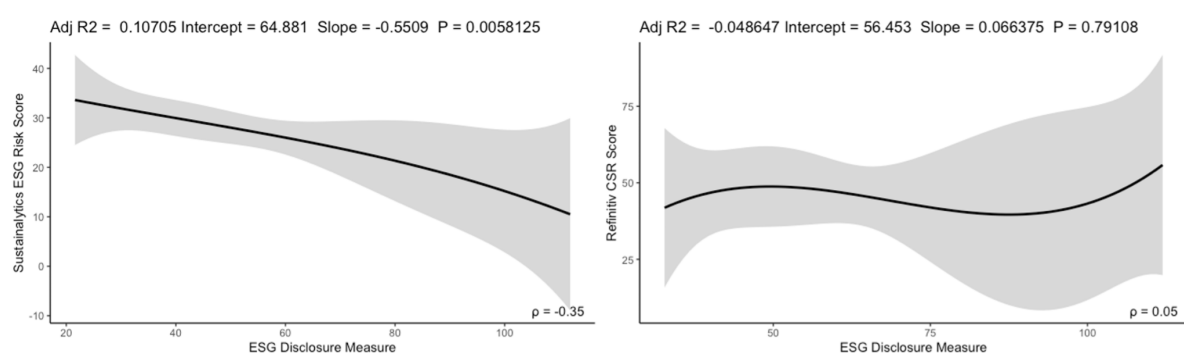
This figure presents the relationship between our ESG disclosure measure and commercially available ratings. The left model uses a subsample of the 61 firms with a Sustainalytics ESG Risk Rating, and the right model uses a subsample of the 21 firms with a Refinitiv Eikon ESG Score. The ESG disclosure measure is the TF-IDF score computed with Equation 3.1. The smoothed lines are nonparametric, local weighted least square regressions, which estimate the commercial ratings using a localised subset of our ESG disclosure measure. We present the smoothed line together with a 95% confidence interval.

The correlation coefficient ρ between our ESG disclosure measure and Sustainalytics ESG Risk Rating in Figure 4.4 is -0.3. This indicates a negative relationship, implicating a link between a high ESG disclosure measure and low ESG risk. Results from a linear regression further confirm a significant relationship at a 1%-level. Thus, the ESG disclosure measure behaves as expected and is relevant in explaining a firm's ESG activities. The correlation coefficient between Refinitiv Eikon and our ESG disclosure measure is 0.05 with a corresponding p-value of 0.79, indicating a weak non-significant relationship. However, we need to be careful to trust the results of this model due to the low sample size of firms with Refinitiv ESG scores.

4.8   Determining Control Variables

For our model to give appropriate results fit to analyse the effect of ESG disclosure, we depend on a solid baseline model. Thus, we select control variables consistent with prior literature examining IPO underpricing.

Firm age is a well-established control variable in IPO underpricing studies. Ritter (1984) suggests that older firms tend to have a more established reputation and more historical data available, reducing the asymmetry information gap between informed and uninformed investors. In addition, Ritter (1991) argues that investors are too optimistic regarding newly-established firms, over-estimating their earning potential. Studies by Lowry and Schwert (2002), Loughran and Ritter (2004) and Lowry et al. (2010) have later confirmed this effect. Hence, we include firm age at the time of the IPO as a control variable.

According to Corwin (2003), market capitalisation at the time of the IPO is used as a proxy for information asymmetry and risk. Market capitalisation is calculated by multiplying the offer price with the number of outstanding shares at the time of listing. Price data is gathered from Euronext Live, the Bloomberg Terminal and Infront. Firms with a stock split after the IPO, causing shares outstanding and offer price to be non-comparable, are adjusted according to available price data when required. The number of shares outstanding is gathered by examining the IPO prospectuses. To ensure a valid basis for comparison, we inflation adjust the market capitalisation using Equation 3.4.

The effect of offer size is well documented. Beatty and Ritter (1986), Carter et al. (1998) and Aggarwal et al. (2002) all argue that increased offer size leads to a decrease in uncertainty and less underpricing. Other studies, such as Michaely and Shaw (1995) and Lowry and Shu (2002), argue that higher offer size increases risk causing issuers and underwriters to underprice the company. We retrieve offer size from Amadeus 3.0 and the Bloomberg Terminal while validating the proceeds by going through news articles, stock exchange- and Euronext Live announcements. After retrieving and validating the offer sizes, we adjust for inflation using Equation 3.3.

Multiple studies argue that whether a firm is backed by private equity (PE) or venture capital (VC) has a significant effect on the first-day return. Bradley and Jordan (2002), Loughran and Ritter (2004) and Lowry et al. (2010) all argue in favour of this effect.

We define a dummy variable for PE-backed firms where buyout-backed and VC-backed firms are included. The IPOs with PE ownership are identified by going through the IPO prospectuses and later cross-referenced with "The state of Nordic private equity" (Argentum, 2018).

Prior literature suggests that technology firms have more underpricing compared to non-technology firms (Loughran and Ritter, 2002; Lowry and Schwert, 2002; Lowry et al., 2010). It is harder to make precise estimates of technology firms' value because of the dependence on growth options (Lowry et al., 2010). Thus, technology firms are exposed to higher risk, leading to increased underpricing. The dummy variable $Technology$ equals one if the firm is in the technology industry, and zero otherwise. We use the industry classification provided by Bloomberg to define technology, in addition to manually checking the firms.

Evidence of an underwriter-effect is first found in studies by Beatty and Ritter (1986) and Carter and Manaster (1990). They report a negative correlation between prestigious underwriters and the first-day returns. Prestigious underwriters have incentives against misleading investors if firms are taken public at excessive valuations, or issuers, if the underpricing is too high. However, Baron (1982) and Loughran and Ritter (2004) argue that prestigious underwriters are associated with increased underpricing, and that underwriters deliberately underprice IPOs to ensure investor participation in future issues. Although the effect of underwriters is ambiguous, the impact is empirically sound, and thus we include it as a control variable. We follow Loughran and Ritter (2004), creating a dummy variable set to one if the underwriter is prestigious, else zero. If there are multiple lead underwriters, we use the rank of the bookrunner or the highest-ranking joint bookrunner.

Ritter (1984) and Ibbotson and Ritter (1995) argues that hot markets are positively associated with IPO underpricing. We define hot markets as a period with substantial underpricing[6]. We use 10.3% as the average Norwegian underpricing gathered from Jay Ritters IPO database. As shown in Table 5.2, 2016, 2020, and 2021 experience underpricing greater than 10.3% and are thus defined as hot markets during our sample period.

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[6]Prior literature defines hot markets as either periods with above average first-day returns or periods with a substantial increase in the number of listings. We choose above average returns as the number of IPOs in our sample is heavily skewed towards 2020 and 2021.

4.9   Summary Statistics

The final sample consists of a sample of 145 IPOs from the period Jan. 2015 until Dec. 2021. We present descriptive statistics on the deal characteristics of our sample in this section. Table 4.3 reports summary statistics for the deal characteristics used in our regressions, excluding the ESG disclosure measures.

The initial sample of IPOs has an average age of 16 with a median of 8. The firms are generally young, but the average value is influenced by a few firms founded before 1900. Furthermore, the average market capitalisation and offer size are NOK 3 558 million and 777 million, respectively. About 55% of the IPOs raised less than 500 million NOK, indicating a sample of small IPOs. The mean market capitalisation is influenced by two large listings, Adevinta ASA and Autostore Holdings Ltd., who at the end of 2021 ranked as the 4th and 9th largest firms on Oslo Stock Exchange (AksjeNorge, 2021).

17% of the IPOs are backed by either private equity or venture capital. This is low compared to the U.S market, where from 2001 until 2020, 52.25% of IPOs were VC-backed (Ritter, 2022). Further, we observe that 60.07% of firms use a prestigious underwriter for their listing. This proportion seems consistent with existing literature, e.g., Loughran and Ritter (2004), where they find that issuers use prestigious underwriters 60% of the time.

Table 4.3: Summary Statistics

Statistic	N	Mean	Median	St. Dev.	Min	Max
Firm Age	145	16.310	8	23.517	0	172
Offer Size	145	782	440	1,091	0	7,924
Market Capitalization	145	3,581	1,293	9,975	62	103,345
% Prestigious Bookrunner	145	60.7	1	49.0	0	1
% Cornerstone	145	12.4	0	33.1	0	1
% PE Backed	145	17.2	0	37.9	0	1
% Technology Firms	145	25.5	0	43.7	0	1

This table shows summary statistics for the sample of 145 firms listed on Oslo Stock Exchange and Euronext Growth from 2015 until 2021. The firm characteristics are the control variables used in our model. Variables are defined in Section 4.8.

5   Descriptive Analysis

In this section, we first present our findings of underpricing in Norway and relate the findings to previous literature. Next, we perform a descriptive quartile analysis of variables to better understand the data sample.

5.1   Underpricing in Norway

Prior research on underpricing in the Norwegian IPO market is reported in Table 5.1. Ritter (2022) has collected data from multiple studies and reports an average first-day return of 10.3% in Norway between 1984 – 2021. Average underpricing in previous studies ranges from 4.3% to 17.0%, depending on the time period.

Table 5.1: Prior Research on Underpricing in Norway

Authors	Time Period	Average Underpricing
Emilsen, Pedersen, & Sættem (1997)	1994 - 1996	12.5%
Westerholm (2006)	1991 - 2002	17.0%
Fjesme (2011)	1993 - 2007	8.0%
Banerjee, Dai, & Shrestha (2011)	2000 - 2006	4.3%
Liden (2004)	1984 - 2004	9.60%
Ritter (2022)	1984 - 2021	10.3%

This table presents prior research on IPO underpricing in the Norwegian market. We collect data from different studies ranging from the period 1984 until 2021. The research is collected from Sættem (1997), Westerholm (2006), Fjesme (2011), Banerjee et al. (2011), Lidén (2004) and Ritter (2022).

As shown in Table 5.2, the total number of IPOs on Oslo Stock Exchange and Euronext Growth within our time frame is 195. Hence our sample covers 74.36% of the IPOs. There has been an increase in the number of listings, particularly during the last two years. Looking at the distribution of offer sizes over the time period, we observe that there has been an increase from 2015 until 2021. Although, the average offer size is lower, indicating a rush of small companies in the last years.

The average equally-weighted and value-weighted[7] returns are 13.8% and 9.01% respectively. The equally-weighted return is 3.5% higher than the average first-day return reported from Ritter (2022). The deviation from prior empirical evidence could be caused by the IPO sample being heavily influenced by the hot markets of 2020 and 2021, which has substantially more IPOs with higher first-day returns. The increase in first-day returns is consistent with international empirical evidence. For the US, Ritter (2022) reports an equally-weighted first-day return of 41.6% and 32.1% in 2020 and 2021, a substantial increase from the 18.9% average from 1980 until 2021.

Table 5.2: Summary of Deal Distribution per Year

Listed Year	N Actual	N Sample	Sum Offer Size	Average Offer Size	Underpricing in %
2015	7	5	3 314	662	2.60
2016	17	5	2 237	447	15.46
2017	19	9	9 773	1 085	2.72
2018	21	5	12 163	2 432	-0.05
2019	10	9	9 483	1 053	4.62
2020	54	47	34 144	726	21.15
2021	67	65	42 461	653	13.16
Full Sample	**195**	**145**	**113 575**	**783**	**13.80**

This table shows the distribution of deals per year within our sample. N Actual represents the actual number of listing in a specific year, gathered from Oslo Stock Exchange archives. N Sample is the number of companies in our sample from a specific year. Sum Offer Price displays the sum of all offer prices for the given year, and Average Offer Size shows the mean size of an offer.

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[7]The value-weighted first-day return is influenced by two large IPOs, AutoStore Holdings Ltd. and Adevinta ASA, which are allocated weights of 19.9% and 10.7%. Without these outliers, the average value-weighted first-day returns amount to 7.33%.

5.2   Descriptive Analysis of Variables

To further understand our sample and ESG disclosure measure, we perform descriptive analysis on a selection of variables. In addition to the tables explained in this section, we include results from quartile analysis of *Underpricing* and *Market Capitalization* in Appendix A0.7 and A0.8.

Table 5.3 presents the means and medians of all variables between the top and bottom quartile of our ESG disclosure measure. The bottom quartile, on average, experiences a significantly higher underpricing of 22.9%. Looking at the independent variables, we observe significant differences in all variables except for the environmental disclosure. This is natural due to the dominance of social- and governance disclosure, as shown in Figure 4.1. Moving on to the control variables, firms with higher ESG disclosure are notably older, use more prestigious underwriters, and are larger in terms of both market capitalization and offer size. This indicates that mature and large companies disclose more about their ESG efforts.

Table 5.3: Quartile Analysis of ESG Disclosure Measure

Statistic	Top Quartile ESG				Bottom Quartile ESG			
	N	Mean	Median	St. Dev.	N	Mean	Median	St. Dev.
Dependent Variable								
Underpricing	36	4.92	0.00	13.51	36	27.81**	9.99*	55.57
Independent Variables								
ESG	36	64.78	62.56	10.77	36	29.42***	30.18***	4.95
Environmental	36	8.03	7.94	6.08	36	6.55	6.08	4.56
Social	36	21.16	20.93	7.93	36	8.23***	7.62***	3.84
Governance	36	35.59	35.27	7.39	36	14.64***	13.21***	4.34
Control Variables								
Firm Age	36	30.7	18	37.5	36	8.5***	6***	8.9
Offer Size	36	1 375	1 014	1 505	36	421***	286***	426
Market Capitalization	36	7 016	3 235	16 942	36	1 118**	945***	846
Prestigious Underwriter	36	0.806	1	0.401	36	0.417***	0***	0.500
PE Backed	36	0.222	0	0.422	36	0.083	0	0.280
Technology	36	0.167	0	0.378	36	0.222	0	0.422
Hot Market	36	0.500	0.5	0.507	36	0.972***	1***	0.167

This table presents summary statistics for the bottom and top quartile of ESG disclosure. We check for differences between the means with a t-test, and medians with the Wilcoxon-Mann-Whitney test. ***, **, * indicate p-values at the 1%, 5%, and 10% level, respectively. Variable definitions are provided in the Appendix A0.1.

Table 5.4 presents means and medians of all variables between the top and bottom quartile of firms with Sustainalytics ESG Risk Rating. We observe that firms with a Sustainalytics rating available for our sample have a higher market capitalization and offer size. This is in line with the characteristics of firms obtaining a rating as described in Section 2.3. Further, we uncover that firms with a Sustainalytics rating utilize prestigious underwriters to a larger extent and are more often backed by private equity.

Table 5.4: Differences in Firms With and Without Sustainalytics ESG Rating

Statistic	Firms Without Sustainalytics ESG Rating				Firms With Sustainalytics ESG Rating			
	N	Mean	Median	St. Dev.	N	Mean	Median	St. Dev.
Dependent Variable								
Underpricing	84	14.021	2.733	37.699	61	12.733	-0.299	40.165
Independent Variables								
ESG	84	44.042	43.328	12.542	61	48.677**	46.720**	12.438
Environmental	84	7.030	5.954	4.959	61	7.367	4.775	5.757
Social	84	13.222	11.992	7.094	61	14.437	10.668	8.128
Governance	84	23.790	23.7	8.728	61	26.873**	29.277**	8.443
Control Variables								
Firm Age	84	13.6	7	17.085	61	15.2	10	17.6
Offer Size	84	544	223	690	61	852*	440**	1 263
Market Capitalization	84	2 870	796	11 297	61	9 207*	1 380**	25 373
Prestigious Underwriter	84	0.476	0	0.502	61	0.639*	1*	0.484
PE Backed	84	0.083	0	0.278	61	0.328***	0***	0.473
Technology	84	0.286	0	0.454	61	0.197	0	0.401
Hot market	84	0.929	1	0.259	61	0.803**	1**	0.401

This table presents summary statistics for the companies that have a Sustainalytics ESG Risk Rating and the firms that do not have one. We check for differences between the means with a t-test, and medians with the Wilcoxon-Mann-Whitney test. ***, **, * indicate p-values at the 1%, 5%, and 10% level, respectively. Variable definitions are provided in the Appendix A0.1.

6 Empirical Results

Now that the level of underpricing is confirmed in our sample and found consistent with existing literature, we move further in our analysis and seek to establish a relationship between underpricing and ESG disclosure. To validate our regression results, we include a regression where we add the commercially available ESG ratings as our independent variable.

6.1 Multiple OLS Regression

We start by estimating an ordinary least squares regression as presented in Equation 6.1:

$$
\begin{aligned}
Underpricing_i = {} & \beta Disclosure_i + \beta Firm\ Age + \beta Market\ Capitalization \\
& + \beta Offer\ Size + \beta PE\ Backed + \beta Technology \\
& + \beta FE\_Listed\ Year_i + \beta FE\_Prestigious\ Underwriter_i \quad (6.1)
\end{aligned}
$$

The dependent variable is $Underpricing_i$, while the $Disclosure_i$ represents the independent variables described in Chapter 4.5 (*ESG disclosure*, *Environmental disclosure*, *Social disclosure*, and *Governance disclosure*). In addition, we control for variables as presented in Section 4.8. We expect the disclosure measures to be partly influenced by unobserved year and underwriter effects and thus include fixed effects for these variables. Further, we utilize cluster bootstrap standard errors by listed year to improve the inference (Cameron et al., 2008). We bootstrap due to the low number of clusters. However, Design (2018) argues that naive cluster standard error models can be useful for inference in some cases even though the number of clusters is small. Thus, we include the results from a model with naive clustering in Appendix A0.9. All regression tables include standard errors presented in parenthesis.

6.2 Results From Our OLS Regression

Model 1 presents a traditional IPO underpricing regression to control our dataset. *Non-Prestigious* indicates a positive effect on underpricing and is significant at a 1%-level.

The positive coefficient implies that firms with non-prestigious underwriters experience higher underpricing. The *Market Capitalization* variable is significant at a 5%-level and shows a negative effect on underpricing. The dummy for 2020 shows a weak positive significance, while the other control variables show no significance. The R^2 for the first regression is 15.5%. In addition, we control for return on assets and industry-specific effects and find no significant effect[8].

Model 2 presents a regression model with the aggregated ESG disclosure. The regression indicates no significant relationship between ESG disclosure and underpricing. The control variables remain the same as the baseline regression in model 1 with no increase in R^2. In the three subsequent models, the disaggregated ESG disclosure measures are added individually. Model 4 and 5 show no significant relationship between the *Social* and *Governance* measures and *Underpricing*. However, model 3 with *Environmental* shows a significant effect on a 5%-level. Model 6 includes all the disaggregated measures and shows no significant effect between ESG and underpricing.

What are the economic significances of the disclosure measures? Following Loughran and McDonald (2013), we calculate the effect on underpricing from the regression output. Multiplying the regression coefficient by the standard deviation of *Environmental* (4.681 times 0.307) implies a change in the first-day return of 1.44%. Thus, a one standard deviation increase in *Environmental* is associated with a 1.44% increase in first-day returns. Together with an increase of 6% in R^2, the environmental disclosure has a positive and significant impact on first-day returns. The result suggests that either underwriters underestimate the demand for firms who extensively disclose their environmental efforts and risks or that investors overpay for the same firms.

Further, repeating this method implies that a one standard deviation increase for *ESG*, *Social* and *Governance* is linked with a change in first-day returns of 0.71%, −5.34% and −1.47%, respectively. Increased social and governance disclosure highlights the risks associated with investments, which in return could reduce asymmetric information. Thus, reducing underpricing due to more informed investment decisions. As opposed to the effect of environmental disclosure, these measures are not significant.

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[8]We compute return on assets by inspecting the prospectuses and dividing EBIT on total assets using the most recent accounting numbers prior to the listing. In addition, we compute industry-specific effects with the use of NACE codes. We do not find a significant effect in any model, nor does it increase R^2; thus, we exclude these variables from our regression table.

Table 6.1: Regression Outputs of the First-Day Return

			Dependent Variable:			
			Underpricing			
	(1)	(2)	(3)	(4)	(5)	(6)
ESG		1.771				
		(5.538)				
Environmental			4.681**			4.173
			(2.330)			(2.549)
Social				-6.754		-5.822
				(6.107)		(6.114)
Governance					-2.906	0.305
					(10.480)	(9.677)
Firm Age	-2.605	-2.757	-2.619	-1.523	-2.376	-1.709
	(3.906)	(3.688)	(3.691)	(4.276)	(3.700)	(4.039)
Market Capitalization	-5.276**	-5.413	-5.592*	-5.246	-4.986*	-5.562**
	(2.592)	(3.406)	(3.189)	(3.343)	(2.923)	(2.767)
Offer Size	3.145	3.172	2.890	3.197	3.045	2.974
	(2.282)	(3.016)	(2.892)	(3.179)	(2.739)	(2.380)
PE Backed	0.028	-0.064	2.563	1.330	0.274	3.384
	(2.508)	(2.756)	(3.352)	(3.583)	(2.822)	(3.530)
Technology	-3.334	-3.302	-0.797	-2.474	-3.185	-0.347
	(7.553)	(7.595)	(7.805)	(7.724)	(7.448)	(8.237)
FE_2016	6.735	6.925	6.949	5.564	6.661	5.924
	(5.262)	(5.476)	(5.423)	(4.927)	(4.928)	(4.877)
FE_2017	-6.326	-6.665	-6.217	-5.320	-5.717	-5.426
	(4.439)	(4.984)	(4.963)	(4.577)	(4.606)	(4.771)
FE_2018	-1.234	-1.526	-5.771	-2.342	-0.796	-6.280
	(3.802)	(4.310)	(4.992)	(4.461)	(3.645)	(5.709)
FE_2019	-0.924	-0.962	-2.735	-1.010	-1.013	-2.604
	(4.718)	(4.666)	(4.572)	(4.699)	(4.223)	(4.753)
FE_2020	9.699*	10.012	7.437	8.029	8.759	6.342
	(5.677)	(6.494)	(5.902)	(5.884)	(6.399)	(6.852)
FE_2021	-1.910	-1.771	-4.967	-3.002	-2.620	-5.502
	(4.308)	(3.990)	(3.930)	(4.433)	(4.115)	(3.887)
FE_ABG	2.786	2.758	3.412	3.573	2.744	4.028
	(2.525)	(2.475)	(3.013)	(3.078)	(5.637)	(4.952)
FE_DNB	-1.800	-1.818	-1.904	-1.813	-1.771	-1.907
	(2.402)	(2.277)	(3.360)	(2.270)	(3.096)	(3.549)
FE_Pareto	4.125	4.140	4.319	4.016	4.156	4.200
	(4.034)	(3.713)	(5.589)	(5.344)	(7.115)	(6.309)
Non-Prestigious	24.611***	24.696***	24.186**	23.503***	24.480**	23.291**
	(8.855)	(8.219)	(10.595)	(8.916)	(10.743)	(10.160)
Constant	27.310*	21.584	23.856	42.760**	35.063	36.734
	(16.150)	(29.485)	(15.421)	(21.783)	(41.162)	(30.081)
Observations	145	145	145	145	145	145
R^2	0.155	0.155	0.161	0.160	0.155	0.165
Adjusted R^2	0.056	0.049	0.057	0.055	0.050	0.046

Note: *p<0.1; **p<0.05; ***p<0.01

This table shows the coefficient estimates from ordinary least squares regressions. The sample is 145 companies listed on Oslo Stock Exchange and Euronext Growth between 2015 and 2021. Underpricing is defined as first-day returns. All variables are defined in Appendix A0.1. Standard errors are bootstrap clustered by listed year and shown in parenthesis. ***, ** and * denote that the coefficient is significantly different from zero at the 1%, 5% and 10% level, respectively.

6.3   Comparing Our Results With Commercial ESG Ratings

To validate our results and ESG disclosure measure, we run a regression where we substitute the ESG disclosure with commercial ESG scores from Sustainalytics and Refinitiv Eikon. Table 6.2 presents the regression model. The dependent variable and control variables remain the same as our main model[9], with the commercial ESG scores added as independent variables. Including only firms with a score from Sustainalytics and Refinitiv reduces our sample IPOs substantially. Sustainalytics include 61 firms, while Refinitiv has a score for 21 firms. To compare the different ESG measures we add ESG disclosure to both regression models.

Model 1 and 4 present the baseline results from the Sustainalytics and Refinitiv samples. Comparing the results to our main regression model, there is a notable difference in control variables, and R^2 has increased to 49.0% and 76.8%, respectively. Offer size is now significant in both subsamples. For the Sustainalytics sample, firm age and technology are showing significant coefficients. In the Refinitiv sample there is a significant effect of the hot market variable. These results are more in line with results from prior literature. This indicates that the main IPO sample is influenced by smaller firms affecting the dataset, as they in general do not get a commercial ESG rating as discussed in Section 2.3.

Model 2 and 5 present our ESG disclosure measure with their respective subsamples. We find no significant effect, solidifying the results from Table 6.1. Further, model 3 and 6 shows the regression with the Sustainalytics ESG Risk Rating and the Refinitiv Eikon ESG Score. The results show no significant effect between the commercial ESG ratings and underpricing. Thus, our main models with the constructed ESG disclosure measure infer the same effects as the models with commercial scores. Implying that our measure capture similar effects.

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[9]We do not include fixed effects or bootstrap clustered standard errors, as the sample size is too low to gain meaningful insights. However, robust standard errors are included.

Table 6.2: Regression With Sustainalytics and Refinitiv ESG Ratings

	(1)	(2)	(3)	(4)	(5)	(6)
			Dependent Variable:			
			Underpricing			
ESG		-2.241			18.992	
		(14.742)			(41.668)	
Sustainalytics			-0.213			
			(0.414)			
Refinitiv						0.551
						(0.401)
Firm Age	-9.921***	-9.755***	-10.325***	-9.651	-11.110	-9.902
	(3.315)	(3.520)	(3.430)	(5.770)	(6.760)	(5.585)
Market Capitalization	-21.340***	-21.228***	-21.543***	-40.156***	-41.472***	-40.383***
	(6.087)	(6.187)	(6.142)	(10.116)	(10.831)	(9.788)
Offer Size	25.582***	25.694***	25.417***	33.546**	33.019**	33.122***
	(7.179)	(7.284)	(7.237)	(11.143)	(11.557)	(10.784)
Underwriter	-46.991***	-46.858***	-46.689***	-70.162***	-73.824***	-67.789***
	(9.493)	(9.621)	(9.577)	(21.850)	(23.936)	(21.208)
PE Backed	1.047	1.237	0.848	0.804	2.167	1.461
	(7.890)	(8.061)	(7.955)	(15.618)	(16.392)	(15.117)
Technology	-16.614*	-16.896*	-18.079*	-27.447	-29.393	-23.100
	(8.917)	(9.189)	(9.421)	(18.191)	(19.252)	(17.880)
Hot market	4.611	4.062	6.152	27.030*	31.087*	32.845**
	(7.831)	(8.692)	(8.435)	(13.869)	(16.853)	(14.067)
Constant	74.179**	81.099	82.916**	197.602***	141.111	172.804***
	(28.903)	(54.065)	(33.701)	(55.176)	(136.391)	(56.343)
Observations	61	61	61	21	21	21
R^2	0.490	0.490	0.493	0.768	0.772	0.800
Adjusted R^2	0.423	0.412	0.415	0.643	0.620	0.666

Note: *p<0.1; **p<0.05; ***p<0.01

This table shows the coefficient estimates from ordinary least squares regressions. Model 1 through 3 has a sample of 62 companies listed on Oslo Stock Exchange and Euronext Growth between 2015 and 2021. Model 4 through 6 has a sample of 21 companies listed on Oslo Stock Exchange and Euronext Growth between 2015 and 2021. Underpricing is defined as first-day returns. All variables are defined in Appendix A0.1. We include robust standard errors shown in parenthesis. ***, ** and * denote that the coefficient is significantly different from zero at the 1%, 5% and 10% level, respectively.

7   Discussion

In this section, we first discuss the robustness of our results and the efforts to ensure robustness. Secondly, we discuss the limitations of our study before suggesting future research recommendations.

7.1   Robustness of Results

Throughout this paper, we have made extensive efforts to obtain robust results. Studies of ESG effects on IPOs have previously used commercially available ESG ratings. These ratings are prone to sample selection bias and omitted variable bias due to incomplete coverage. We avoid this by constructing an ESG disclosure measure, ensuring the inclusion of all companies. The self-constructed ESG measure is based on text mining the prospectuses in our sample period and will thus be one of the most substantial sources of uncertainty in our model. To combat this, we have made extensive efforts to confirm the relevance of our measure. The dictionary is provided by Baier et al. (2020), and later validated with context analysis, which resulted in our keywords being used in an ESG context. Further, we compare our ESG measure with ESG ratings from Sustainalytics and Refinitiv Eikon. At last, we compare companies with a commercial ESG rating with those who don't.

To ensure a robust regression model, we run a bootstrap clustered regression model to avoid heteroskedasticity, and fixed effects to account for unobservable factors in underwriter and listing year. We also check for multicollinearity with a variance inflation factor test. At last, to validate the regression model, we run a regression with commercially provided ESG ratings and compare the results.

7.2   Limitations and Econometric Pitfalls

There are limitations regarding the measurement of ESG disclosure. Even though a reliable data source is used, the IPO prospectus, it is debatable whether this is a reasonable source for measuring firms' ESG efforts. One central question is how standardised these prospectuses are. In addition, annual reports, ESG reports, news articles, company

websites and statements could also be relevant for measuring a company's ESG disclosure. Although, these sources are usually not available for newly listed firms. Thus, our choice of data source is the only reliable source commonly available for all firms, but it could be insufficient in capturing the total ESG disclosure.

Textual analysis with the use of a dictionary is successfully applied, but still has drawbacks. The method is a variant of the "bag-of-words" method, which is a general term for taking words out of their context and counting them. A problem might be that the multidimensional characteristic of a document is underestimated (Loughran and Mcdonald, 2016). For instance, the ESG words extracted from the documents could have different meanings in different contexts. We make extensive efforts to validate these contexts but acknowledge that this could be an issue. The dictionary from Baier et al. (2020) also has limitations, as relevant ESG words could be excluded. Further, our translation of the dictionary and construction of a Norwegian one could have the same issues.

Another limitation in our thesis is the sample size, being limited to the number of IPOs in Norway during our relatively short time period. This is especially prominent in the Sustainalytics and Refinitiv Eikon sample that we use to validate our model, where the limited number of scores forces us to remove more than 50% of our sample. Thus, more extensive coverage of Norwegian firms would improve the quality of the models. In addition, several relationships explain the probability of a firm being ESG-rated, e.g. the company's size and age. This implies that rating agencies' selection process is not random, thus leading to a sample selection bias in the regressions with the commercial ratings. It also emphasises that the result from our validation only applies to firms with commercial ratings, and that our results could be different if all firms were rated.

Despite obtaining a significant result on the effect of Environmental disclosure, we acknowledge that the sample size may be insufficient to draw causal effects and relationships. The magnitude of the problem can be reduced by enhancing the size of the sample, e.g. by increasing the time frame or the geographical area. A larger sample will likely increase the validity of the inference. In addition, a substantial amount of the data are gathered manually and from different sources, opening the possibility for human errors. Particularly regarding the conversion of offer sizes from various currencies to NOK. To the best of our abilities, we have tried to compute and report the actual deal characteristics.

Norway has a leading position in ESG integration, as discussed in Section 2.1. This may suggest that most firms in our sample are relatively sustainable in a global context. The actual effect of ESG disclosure, when analysed on a global sample, could therefore be substantially different from our findings and constitutes an important implication for future research.

7.3 Future Research Recommendations

Textual analysis methods are increasingly used within the field of finance. There is little documented research of ESG effects on the Norwegian market. Hence, we suggest that future papers further explore the area. For instance, using our Norwegian dictionary to study the effect of ESG disclosure on other documents such as annual reports, company statements and news articles. In addition, the aftermarket performance of our sample should be analysed to infer ESG disclosure effects over time. However, there is not enough historical data to yield meaningful results at the time of writing.

Our finding of a significant effect of Environmental disclosure suggests that further analysis should be made. We particularly find it useful to utilise textual analysis to create ESG disclosure measures and investigate the effect in other geographical markets. This is especially relevant for markets with lacking coverage from commercial rating agencies. For instance, it is possible to look at the Nordic region jointly and individually to uncover whether the effect varies between the seemingly similar countries.

8 Conclusion

In this thesis, we construct a measure of ESG disclosure to investigate the effect of ESG on IPO underpricing in Norway within the time frame Jan. 2015 until Dec. 2021. We first utilise textual analysis methods to create an ESG disclosure measure. Our sample comprises of 145 IPO prospectuses from listings on Oslo Stock Exchange and Euronext Growth. We construct a dictionary-based aggregated and disaggregated ESG disclosure measure by analysing the documents using a Term Frequency-Inverse Document Frequency weighting scheme. The dictionary consists of 482 ESG words across the Environmental, Social and Governance categories.

When performing analyses on ESG effects on the Norwegian market, commercial ESG rating agencies cannot be depended on due to lacking coverage. To conduct the analysis, we thus need to construct an ESG disclosure measure. We make extensive efforts to confirm the relevance of our ESG disclosure measure with qualitative assessments. Using a Key Word In Context table and excerpts of paragraphs containing top ESG words from the individual E, S and G categories, we confirm that our measure captures ESG disclosure and not arbitrary information. The measure is further validated by investigating the relationship with commercially available scores from the ESG rating agencies Sustainalytics and Refinitiv Eikon.

We find no significant impact from aggregated ESG disclosure on underpricing, which is consistent with related studies examining the effect of ESG on the stock market (Revelli and Viviani, 2015; Sargis and Wang, 2020). Neither does the disaggregated Social and Governance Disclosure. However, contrary to findings from prior studies on ESG effects on underpricing, our research finds that Environmental disclosure affects underpricing in Norway. Our results are significant at a 5% level and suggest that one standard deviation increase in Environmental disclosure increases IPO underpricing by 1.44%.

Our research has hopefully given valuable insights into measuring ESG-disclosure in a financial context with the use of textual analysis. In addition, to ensure the validity and relevance of our research, we analyse the presence of underpricing in our sample. We define underpricing as the "first-day return" and compute the average return with the purpose of updating existing literature. We confirm that underpricing of IPOs is a phenomenon

present in the Norwegian stock market and uncover an average first-day return of 13.8% within our sample.

Another contribution is our dictionary for Norwegian ESG terms that can be applied in textual analysis of documents written partly or entirely in Norwegian. The dictionary is a translation of the dictionary made by Baier et al. (2020), where we add relevant Norwegian ESG words. As duplicates are filtered in the Norwegian version, we suggest using both simultaneously. Textual analysis is a growing field within finance, although there is an absence of research within the field on the Norwegian market. We recommend future research to use our Norwegian dictionary and explore the effect of ESG-disclosure on different documents and parts of the market. We particularly find it relevant to analyse the aftermarket performance of our sample of companies when there is enough historical data to yield meaningful results.

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Appendix

Table A0.1: Variable Definitions

Variables	Definitions
Underpricing	A measure of a company's return on the first day of trading. We compute the return using the first-day closing price and the offer price in the IPO.
TF-IDF	Our measure of ESG disclosure is based on a Term Frequency-Inverse Document Frequency weighting scheme of ESG words from a firm's IPO prospectus.
ESG	The natural logarithm of one plus the TF-IDF measure, from using all ESG words of a firm's IPO prospectus.
Environmental	The natural logarithm of one plus the TF-IDF measure from using all Environmental words, of a firm's IPO prospectus.
Social	The natural logarithm of one plus the TF-IDF measure from using all Social words, of a firm's IPO prospectus.
Governance	The natural logarithm of one plus the TF-IDF measure from using all Governance words, of a firm's IPO prospectus.
Firm Age	The natural logarithm of one plus the age of the firm at the time of listing.
Market Capitalization	The natural logarithm of the CPI adjusted market capitalization.
Offer Size	The natural logarithm of one plus the CPI adjusted offer size.
PE Backed	Dummy variable set to one if the firm is backed by either a venture capital or private equity fund, else zero.
Technology	Dummy variable set to one if the firm belongs to the technology industry, else zero.
Non-Prestigious	Dummy variable set to one if the underwriter for a given firm is not either ABG Sundal Collier, DNB Markets or Pareto Securities, else zero.
Underwriter	Dummy variable set to one if the underwriter for a given firm is one of the prestigous underwriters ABG Sundal Collier, DNB Markets or Pareto Securities, else zero.
FE_Year	Variable set to one for the year a firm is listed and zero for all other years.
D_ABG	Dummy variable set to one if the underwriter for a given firm is ABG Sundal Collier, else zero.
D_DNB	Dummy variable set to one if the underwriter for a given firm is DNB Markets, else zero.
D_Pareto	Dummy variable set to one if the underwriter for a given firm is Pareto Securities, else zero.
Hot Market	Dummy variable set to one if the firm was listed in either 2016, 2020 or 2021, else zero.

Figure A0.1: Word Cloud of the Most Frequently Used Norwegian ESG Words

This figure shows the most frequently used Norwegian ESG words across the total sample of IPO prospectuses. The ESG words originate from our self made dictionary found in Appendix A0.6. The figure includes the top 20 used words from each of the Environmental, Social and Governance dimensions which are coloured green, red and blue, respectively. The font size illustrates the word frequency.

Table A0.3: Word in Context Frequency Table for Three Selected ESG Words

Miljø		Kjønn		Utslipp	
Left Context	Right Context	Left Context	Right Context	Left Context	Right Context
ytre	forurenser	uavhengig	alder	forurensning	co2
gjelsten	selskapet	begge	etnisitet	overvåking	tonn
fokus	virksomhet	forskjellsbehandling	etnisk	direkte	bil
ceo	konsernets	grunnet	religion	flyreiser	sikre
drift	likestilling	arbeidsplass	seksuell	form	anlegg
equal	medfører	arbeidsvilkår	selskapet	første	avslutter
forurenser	oslo	forekommer	andre	høyeste	energiforbruk
opportunity	energiforbruk	grunn	bakgrunn	indirekte	følge
samfunn	selskapets	like	forhold	kontorer	klimagasser
ulykker	antall	muligheter	sosial	kontoret	knyttet

This table provides a summary from a Key Word In Context (KWIC) analysis on Norwegian words used in the prospectuses. We show the ten most frequent words surrounding the selected keyword for the left and right context. The words are ordered descendingly by frequency. E.g., out of three words in the left context of the word "miljø", counting for all firms in total, the most used word is "ytre".

Table A0.4: Excerpts From the IPO Prospectuses of Various Firms in Norwegian

Company

Panel A: Keyword = Miljø

Nordic Halibut 2021.04.22

"Virksomheten innebærer aktiviteter som virker belastende på det ytre <mark>miljø</mark>. Selskapet driver imidlertid kontinuerlig og omfattende utvikling og forbedringer av virksomheten for å oppnå redusert miljøpåvirkning parallelt med bedre produksjonsprosesser og kostnadseffektivisering."

Fjord1 2017.08.14

"Ei slik utvida satsing på dette området fordrar at oppdragsgivarane vil fortsetje å stimulere til <mark>miljø</mark>- og utsleppstiltak gjennom fram- tidige kontraktutlysingar. Fjord1 AS har i dag 12 store gassdrivne ferjer i drift."

Andfjord Salmon 2020.06.23

"Selskapet forurenser ikke vesentlig det ytre <mark>miljø</mark> i nåværende fase og har iverksatt miljøtiltak i forbindelse med utbyggingen på Kvalnes. Selskapet har knyttet seg opp mot FN sine bærekraftsmål, og vil utvikle rapportering etter dette."

Panel B: Keyword = Kjønn

Instabank 2020.08.12

"Instabank ASA er opptatt av å gi like muligheter til ansettelse, kompetanseutvikling, avansement og øvrige arbeidsvilkår, uavhengig av <mark>kjønn</mark>, alder, eller sosial, etnisk og kulturell bakgrunn."

Flyr 2021.02.26

"Dette innebærer at vi behandler hverandre med respekt og at det er nulltoleranse for enhver form for diskriminering, dette gjelder blant annet diskriminering basert på religion, hudfarge, <mark>kjønn</mark>, seksuell legning, alder, nasjonalitet, rase eller funksjonshemning."

Rana Gruber 2021.02.25

"Bedriftens lønnssystemer skiller ikke mellom kjønnene, og arbeidstidsbestemmelsene er like for begge <mark>kjønn</mark>. Bedriften har tatt tydelig standpunkt i metoo-kampanjen, og dessuten tatt frem og belyst rutinene for varsling."

Panel C: Keyword = Utslipp

Bergen Carbon Solutions 2021.04.19

"Vi har ikke utslipp til vann, og til luft er det kun små mengder CO2 fra renseprosessen. Vi har en målsetning om å ha null <mark>utslipp</mark> når produksjonen er i gang på Flesland. Vår klimastrategi henger tett sammen med vår forretningsstrategi."

Fjordkraft 2018.03.09

"Fjordkraft benytter FNs definisjon av klimanøytrale virk- somheter, og de anerkjente standardene til «World Re- sources Institute» og «Greenhouse Gas Protocol» for å beregne leverandørens direkte og indirekte <mark>utslipp</mark>."

Zaptec 2020.10.01

"Nedgangen i elbil-salget i forbindelse med koronakrisen anses kun som en utsettelse da de ulike landene og bilmarkedene har I offensive mål for å redusere CO2 utslippene fremover, og hvor redusert <mark>utslipp</mark> som følge av elektrifisering av bilparken er en vesentlig bidragsyter."

This table shows paragraphs from the sections written in Norwegian in IPO prospectuses from nine firms. The keywords we have searched for are "miljø", "kjønn" and "utslipp", shown in Panel A, Panel B and Panel C respectively. The keywords are highlighted in yellow. The date below each firm name is the date of the IPO prospectus filing.

Table A0.5: ESG Dictionary From Baier et al. (2020)

Environmental	agriculture, air, atmosphere, biodiversity, biofuel, biofuels, biphenyls, carbon, clean, cleaner, cleanup, climate, coal, contamination, deforestation, emission, emissions, emit, environmental, epa, fossil, freshwater, ghg, ghgs, green, greenhouse, groundwater, hazardous, householding, nitrogen, pesticide, pesticides, pollutants, pollution, printing, recycle, recycling, renewable, resource, solar, species, stewardship, superfund, sustainability, toxic, warming, waste, wastes, water, weee, wetlands, wilderness, wildlife, wind, zoning
Social	alcohol, bargaining, bisexual, bugs, charitable, charities, charity, childbirth, children, citizen, citizens, communities, community, conformance, courses, csr, defects, dignity, disabilities, disability, disabled, discriminate, discriminated, discriminating, discrimination, diversity, donate, donated, donates, donating, donation, donations, donors, drinking, drug, educate, educated, educates, educating, education, educational, eeo, eicc, employ, employment, endowment, endowments, epidemic, equality, ethnic, ethnically, ethnicities, ethnicity, expression, fairness, fda, female, females, fla, foundation, foundations, freedom, gay, gays, gender, genders, gift, gifts, harassment, headcount, health, healthy, hire, hired, hires, hiring, hiv, homosexual, human, humanity, ill, illness, ilo, immigration, injury, inspection, inspections, labor, labour, learning, lesbian, lesbians, lgbt, marriage, medicaid, medicare, medicine, medicines, mentoring, minerals, minorities, minority, ms, nations, nondiscrimination, nonprofit, occupational, overtime, pandemic, peace, people, philanthropic, philanthropy, poverty, privacy, race, racial, religion, religious, ruggie, safe, safely, safety, scholarships, sex, sexual, sick, social, socially, societal, society, staffing, standardization, teach, teacher, teachers, teaching, training, transgender, un, unemployment, veteran, veterans, vulnerable, wage, wages, warranty, welfare, woman, women, workplace
Governance	align, aligned, aligning, alignment, aligns, announce, announced, announcement, announcements, announces, announcing, appreciation, approval, approvals, approve, approved, approves, approving, asc, assess, assessed, assesses, assessing, assessment, assessments, attract, attracting, attracts, audit, audited, auditing, auditor, auditors, audits, award, awarded, awarding, awards, backgrounds, ballot, ballots, bonus, bonuses, bribery, brother, bylaw, bylaws, cast, cd, charter, charters, clicking, cobc, communicate, communicated, communicates, communicating, compact, compensate, compensated, compensates, compensating, compensation, compliance, conduct, conflict, conflicts, conformity, consent, control, controls, corrupt, corruption, coso, crimes, culture, death, detect, detected, detecting, detection, disclose, disclosed, discloses, disclosing, disclosure, disclosures, duly, eip, elect, elected, electing, election, elections, elects, embezzlement, engagement, engagements, erm, ethic, ethical, ethically, ethics, evaluate, evaluated, evaluates, evaluating, evaluation, evaluations, examination, examinations, examine, examined, examines, examining, fairly, family, fasb, feedback, gaap, governance, grandchildren, grandparent, grandparents, grassroots, honesty, hotline, incentive, incentives, independence, independent, influence, influences, influencing, inform, insider, insiders, inspector, inspectors, integrity, interlocks, interview, interviews, investor, invite, invited, irs, iso, isos, leadership, liaison, lobbied, lobbies, lobby, lobbying, lobbyist, lobbyists, mail, mailed, mailing, mailings, misconduct, motivate, motivated, motivates, motivating, motivation, nephews, nieces, nominate, nominated, nomination, nominations, nominee, nominees, notice, objectivity, oversee, overseeing, oversees, oversight, parachute, parachutes, parents, payout, payouts, pension, perquisites, perspectives, plane, planes, plurality, poison, posting, presentation, presentations, press, proponent, proponents, proposal, proposals, proxies, prsu, prsus, qualifications, quorum, recoupment, recruit, recruiting, recruitment, refreshment, relations, relatives, remuneration, retain, retainer, retainers, retaining, retention, retirement, review, reviewed, reviewing, reviews, reward, rewarding, rewards, rotation, rsu, rsus, salaries, salary, sarbanes, severance, siblings, sister, skill, skills, son, spousal, spouse, spouses, stakeholder, stakeholders, stepchildren, stepparents, succession, sustainable, talent, talented, talents, tenure, test, tested, testing, tests, transparency, transparent, treadway, ungc, vacancies, vacancy, vest, vested, vesting, vests, visit, visiting, visits, vote, voted, votes, voting, webpage, website, whistleblower

This table shows the full ESG dictionary for each ESG dimensions created by Baier et al. (2020). The ESG dictionary is broken down to 55 environmental terms, 151 social terms and 276 governance terms.

Table A0.6: Norwegian ESG Dictionary From Skjæveland & Wikan (2022)

Environmental	arter, atmosfære, avfall, avskoging, bifenyler, biodiversitet, biodrivstoff, bærekraftig, drivhus, dyreliv, farlig, ferskvann, fornybar, forurensing, forurensinger, forurensning, forvaltning, fossilt, giftig, grunnvann, grønn, husholdning, jordbruk, karbon, klima, klimagassutslipp, klimagassutslippene, kull, luft, miljø, miljøfarleg, miljøfarlig, miljøvennleg, miljøvennlig, miljøpåvirkning, myr, natur, opprydding, oppvarming, plantevernmiddel, ren, renere, resirkulere, resirkulering, ressurs, slipper, solenergi, solkraft, soneinndeling, sprøytemidler, superfond, søppel, utslipp, utslippene, vann, vind
Social	alkohol, ansatt, ansatte, ansette, ansettelse, ansetter, arbeid, arbeidsledighet, arbeidsplass, barn, bemanning, biseksuell, bistand, defekter, diskriminere, diskriminering, diskriminert, donasjon, donasjoner, donere, donerer, donerte, donorer, ekteskap, emea, epidemi, etnisitet, etnisk, fattigdom, filantrop, filantropi, fn, forhandlinger, fred, frihet, frisk, funksjonshemmet, funksjonshemming, funksjonsnedsatt, fødsel, garanti, gave, gaver, helse, helseforsikring, helsehjelp, homofil, homofile, homofiles, homofili, homoseksuell, ideell, innbygger, innbyggere, innvandring, insekter, inspeksjon, inspeksjoner, jente, jenter, kjønn, kurs, kvinne, kvinner, land, legat, legater, legemidler, lesbisk, lesbiske, likhet, lære, lærer, lærere, læring, læring, lønn, lønninger, mangfold, medikament, medisin, menneske, menneskeheten, mentor, mineraler, minoriteter, minoriteter, overtid, pandemi, personer, personvern, rase, religiøs, rettferdighet, samfunn, samfunnet, samfunnsmessig, samsvar, seksuelt, skade, sosialt, standardisering, stiftelse, stiftelser, stipend, syk, syk, sykdom, sårbar, trakassering, transseksuell, trening, trygg, trygghet, trygt, utdanne, utdanner, utdannet, utdanning, utrykk, veldedige, veldedighet, velferd, verdighet, veteran, veteraner, yrkesmessig
Governance	avgi, avsløre, avslører, avsløringer, avslørte, avstemming, bakgrunner, barnebarn, beholde, behørig, belønne, belønning, belønninger, besteforelder, besteforeldre, bestikkelser, besøk, besøker, bevaring, bonuser, bror, bærekraftig, død, ektefelle, ektefeller, ektemann, engasjement, etikk, etisk, etiske, etterfølger, etterlønn, evaluere, evaluerer, evaluering, evalueringer, evaluert, familie, ferdighet, ferdigheter, fly, forbindelse, foreldre, forfriskning, formidling, forriglinger, forslag, frynsegoder, fullmakter, gift, gjenkjenning, gjennomgang, gjennomgår, gjennomgått, godkjenner, godtgjørelse, grasrot, informere, innretting, innsider, innsidere, insentiv, insentiver, inspektør, inspektører, integritet, interessent, interessenter, intervju, intervjuer, invitasjon, invitert, justeres, justering, justert, klikke, kommunisere, kommuniserer, kommuniserte, kompakt, kompensasjon, kompensere, kompenserer, kompensert, konflikt, konflikter, konformitet, kontroll, kontroller, kontrollere, korrupsjon, korrupt, kriminalitet, kultur, kunngjorde, kunngjør, kunngjøre, kunngjøring, kunngjøringer, kvalifikasjoner, lederskap, ledig, ledighet, lobbet, lobbyer, lobbyister, lobbyvirksomhet, lønn, lønninger, melding, motivasjon, motivere, motiverende, motivert, nettside, nieser, nominasjon, nominasjoner, nominere, nominert, nominert, nominerte, nyansatt, nøvøer, objektivitet, oppdage, oppdager, oppdaget, oppførsel, opptjene, opptjening, opptjent, overser, overvåke, overvåker, pensjon, pensjonering, perspektiver, pluralitet, postet, presentasjon, presentasjoner, presse, priser, påvirke, påvirker, rekruttere, rekruttering, relasjoner, rettferdig, revidere, revidert, revisjon, revisjoner, revisor, revisorer, rotasjon, samtykke, skatteetaten, slektninger, sluttpakke, sluttvederlag, stebarn, steforeldre, stemme, stemmer, stemmeseddel, stemmesedler, stemte, styresett, sønn, søsken, søster, takknemlig, talenter, talentfull, talsmann, talsmenn, teste, tester, tilbakebetaling, tilbakeholde, tilbakeholder, tilbakemelding, tildele, tildeling, tildelt, tilpasse, tilsyn, tiltrekke, tiltrekkelse, tiltrekker, uavhengig, uavhengighet, underslag, undersøke, undersøkelse, undersøkelser, undersøkende, undersøker, undersøkte, utbetaling, utbetalinger, utsendelse, utsendelser, valg, valgt, varsler, vedtekt, vedtekter, velge, velger, vurdere, vurderer, vurdering, vurdert, åpenhet, ærlighet

This table shows the full Norwegian ESG dictionary for each ESG dimensions created by us. The Norwegian ESG dictionary is mainly a translation of the ESG dictionary from Baier et al. (2020) displayed in Appendix A0.5, with the addition of some Norwegian ESG words and removal of duplicates. The dictionary is broken down to 69 environmental terms, 132 social terms and 236 governance terms.

Table A0.7: Quartile Analysis of Underpricing

		Top Quartile Underpricing				Bottom Quartile Underpricing		
Statistic	N	Mean	Median	St. Dev.	N	Mean	Median	St. Dev.
Dependent Variable								
Underpricing	36	57.02	39.44	51.18	36	−11.36***	−10.19***	6.53
Independent Variables								
ESG	36	41.62	39.88	12.41	36	47.03*	44.30	14.07
Environmental	36	7.35	6.86	5.58	36	7.15	4.52	6.07
Social	36	12.27	10.11	6.62	36	15.40*	14.57**	7.41
Governance	36	22.00	22.89	7.86	36	24.49	20.85	9.45
Control Variables								
Firm Age	36	15.4	7.5	22.0	36	15.4	8.5	22.0
Offer Size	36	566	323	797	36	1 036*	533**	1 441
Market Capitalization	36	2 056	963	3 774	36	3 345	1 845**	3 668
Prestigious Underwriter	36	0.444	0	0.504	36	0.750***	1**	0.439
PE Backed	36	0.139	0	0.351	36	0.194	0	0.401
Technology	36	0.250	0	0.439	36	0.306	0	0.467
Hot Market	36	0.944	1	0.232	36	0.778**	1**	0.422

This table presents summary statistics for the bottom and top quartile of underpricing. We check for differences between the means with a t-test, and medians with the Wilcoxon-Mann-Whitney test. ***, **, * indicate p-values at the 1%, 5%, and 10% level, respectively. Variable definitions are provided in the Appendix A0.1.

Table A0.8: Quartile Analysis of Market Capitalization

		Top Quartile market cap				Bottom Quartile market cap		
Statistic	N	Mean	Median	St. Dev.	N	Mean	Median	St. Dev.
Dependent Variable								
Underpricing	36	3.87	0.00	17.28	36	23.26**	11.77**	44.89
Independent Variables								
ESG	36	56.34	53.49	15.87	36	40.77***	40.98***	10.21
Environmental	36	8.10	8.85	6.41	36	6.86	6.08	5.19
Social	36	17.37	15.64	8.91	36	12.42***	12.05**	5.63
Governance	36	30.87	31.18	11.22	36	21.50***	20.97***	8.37
Control Variables								
Firm Age	36	25.7	10.5	36.4	36	8.9**	6**	7.8
Offer Size	36	1 939	1 323	1 623	36	107***	103***	67
Market Capitalization	36	11 078	6 080	18 185	36	366***	373***	151
Prestigious Underwriter	36	0.833	1	0.378	36	0.278***	0***	0.454
PE Backed	36	0.222	0	0.422	36	0.194	0	0.401
Technology	36	0.222	0	0.422	36	0.333	0	0.478
Hot Market	36	0.639	1	0.487	36	0.944***	1***	0.232

This table presents summary statistics for the bottom and top quartile of market capitalization. We check for differences between the means with a t-test, and medians with the Wilcoxon-Mann-Whitney test. ***, **, * indicate p-values at the 1%, 5%, and 10% level, respectively. Variable definitions are provided in the Appendix A0.1.

Table A0.9: Effects on Underpricing With Naive Clustered Standard Errors

				Dependent Variable:		
				Underpricing		
	(1)	(2)	(3)	(4)	(5)	(6)
ESG		1.771				
		(3.559)				
Environmental			4.681**			4.173**
			(2.128)			(1.991)
Social				-6.754		-5.822
				(4.520)		(4.336)
Governance					-2.906	0.305
					(1.894)	(2.891)
Firm Age	-2.605	-2.757	-2.619	-1.523	-2.376	-1.709
	(3.434)	(3.248)	(3.384)	(4.426)	(3.404)	(4.189)
Market Capitalization	-5.276***	-5.413***	-5.592***	-5.246***	-4.986***	-5.562***
	(1.442)	(1.609)	(1.736)	(1.515)	(1.512)	(1.904)
Offer Size	3.145**	3.172**	2.890**	3.197**	3.045**	2.974*
	(1.337)	(1.383)	(1.460)	(1.414)	(1.343)	(1.561)
PE Backed	0.028	-0.064	2.563	1.330	0.274	3.384**
	(1.065)	(0.942)	(1.731)	(1.119)	(0.969)	(1.644)
Technology	-3.334	-3.302	-0.797	-2.474	-3.185	-0.347
	(7.756)	(7.779)	(8.462)	(8.598)	(7.877)	(9.049)
FE_2016	6.735	6.925	6.949	5.564	6.661	5.924
	(5.226)	(5.452)	(5.542)	(4.941)	(5.310)	(5.248)
FE_2017	-6.326*	-6.665**	-6.217	-5.320	-5.717	-5.426
	(3.513)	(3.303)	(4.296)	(4.478)	(3.538)	(4.853)
FE_2018	-1.234	-1.526	-5.771**	-2.342	-0.796	-6.280*
	(2.917)	(2.910)	(2.772)	(3.108)	(2.950)	(3.285)
FE_2019	-0.924	-0.962	-2.735	-1.010	-1.013	-2.604
	(4.823)	(4.751)	(4.478)	(5.451)	(4.872)	(5.159)
FE_2020	9.699	10.012	7.437	8.029	8.759	6.342
	(6.070)	(6.407)	(5.893)	(5.884)	(6.273)	(6.199)
FE_2021	-1.910	-1.771	-4.967	-3.002	-2.620	-5.502
	(7.291)	(7.447)	(6.707)	(7.241)	(7.472)	(7.107)
D_ABG	2.786*	2.758*	3.412**	3.573**	2.744*	4.028***
	(1.578)	(1.663)	(1.684)	(1.738)	(1.506)	(1.427)
D_DNB	-1.800	-1.818	-1.904	-1.813	-1.771	-1.907
	(2.090)	(2.200)	(3.496)	(1.673)	(2.229)	(2.925)
D_Pareto	4.125	4.140	4.319	4.016	4.156	4.200
	(3.774)	(3.833)	(4.998)	(4.056)	(3.837)	(5.166)
Non-Prestigious	24.611***	24.696***	24.186**	23.503***	24.480***	23.291**
	(9.058)	(9.049)	(10.587)	(8.782)	(9.316)	(10.206)
Constant	27.310**	21.584	23.856*	42.760***	35.063***	36.734***
	(11.594)	(18.918)	(13.473)	(8.946)	(13.523)	(12.558)
Observations	145	145	145	145	145	145
R^2	0.155	0.155	0.161	0.160	0.155	0.165
Adjusted R^2	0.056	0.049	0.057	0.055	0.050	0.046

Note: *p<0.1; **p<0.05; ***p<0.01

This table shows the coefficient estimates from ordinary least squares regressions. The sample is 145 companies listed on Oslo Stock Exchange and Euronext Growth between 2015 and 2021. Underpricing is defined as first-day returns. All variables are defined in Appendix A0.1. Standard errors are naively clustered by listed year and shown in parenthesis. ***, ** and * denote that the coefficient is significantly different from zero at the 1%, 5% and 10% level, respectively.