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Uncovering the Dynamics of Cornerstone  
Investors in Scandinavian IPOs:  
Money Left on the Table?

*An empirical study of cornerstone commitments and its impact on  
subsequent underpricing of Scandinavian IPOs.*

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## **Abstract**

This study examines the relationship between IPO underpricing and the involvement of cornerstone investors in the Scandinavian IPO market. Utilizing comprehensive regression models, our analysis reveals a strong and positive association between cornerstone involvement and the subsequent IPO underpricing. The findings suggest that the certification endorsement from cornerstone investors positively affects the market valuation and demand for the IPO, leading to excess underpricing. The underpricing can be attributed to higher secondary market prices and performance rather than unrealized proceeds, and therefore not constituting money left on the table. Additionally, the causal relationship between cornerstone investors and underpricing is amplified during periods of hot market sentiment. These insights have implications for issuing firms, investors, and underwriters in understanding the benefits of attracting cornerstone investors in the IPO process.

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# 1. Introduction

This study examines the emerging practice of cornerstone investors in the Scandinavian IPO market, with the objective of exploring the relationship between IPO underpricing<sup>1</sup> and the presence of cornerstone involvement. Cornerstone investors are investors who agree to acquire shares in the IPO before the formal book building process, and are therefore guaranteed a predetermined allocation for a set price (BCG, 2021). Contrary to strategic investors like venture capital and private equity firms, cornerstone investors are typically purely financially motivated with a shorter investment horizon (Espenlaub et al., 2015). Disclosures of cornerstone involvements in the IPO prospectus, including the details of their allocation and agreement, provides important information regarding the perceived risk and value of the issuing firm (McGuinness, 2014).

The cornerstone practice for IPOs originated from Asian markets (McGuinness, 2014), and has only since 2014, really been part of the Scandinavian IPO markets. Although cornerstone involvement is a relatively recent addition, it has quickly emerged as an integral part of IPO processes. However, this phenomenon remains relatively unexplored in Scandinavia. Thus, this thesis adds value to the existing literature on Scandinavian IPOs by unveiling novel insight surrounding the concept of cornerstone investors and its relation to underpricing and IPO dynamics.

The IPO market following the Covid-19 outbreak proved to be the most active and eventful period in the history of the Scandinavian capital markets (Nasdaq, 2022). By including the large amount of IPO data originating from this period, our thesis brings new perspectives to previous cornerstone-related research. Covering a fourteen-year time horizon, our research examines diverse market conditions, capturing changes in the relationship between IPO dynamics and cornerstones. Considering the prevailing trend of cornerstone involvement for the majority of Scandinavian IPOs, we are able to construct a comprehensive dataset. To the best of our knowledge, this allows us to perform extensive research and at a larger scale than any previous study covering cornerstone-related underpricing in a Scandinavian context.

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<sup>1</sup> Underpricing is also known as initial returns. We use the two concepts interchangeably.

This thesis examines and focuses on the immediate effects of involving cornerstone investors, thereby exclusively considering the first-day returns of IPOs, rather than their long-term performance. This focus allows for the identification of short-term investment opportunities.

The analysis, utilizing comprehensive regression models for 538 IPOs, yields robust evidence implying that cornerstone involvement exhibits a strong positive association with subsequent IPO underpricing. The findings reveal that the presence of cornerstone investors increases the expected underpricing by 11.3 percentage points (pp), after controlling for other variables. We mainly attribute this effect towards two hypotheses. Firstly, the certification endorsement from cornerstone investors will positively affect the market valuation and demand for the IPO. Conversely, the second hypothesis argues that excessive IPO underpricing arises from the superior ability of cornerstone investors to identify high-quality companies pre-IPO, essentially separating the wheat from the chaff.

The findings also reveal that the causal relationship between cornerstone investors and IPO underpricing increases with a higher degree of cornerstone undertaking<sup>2</sup>. Further analysis uncovers that hot market sentiment in combination with high cornerstone undertaking strongly amplifies the joint effect on IPO underpricing. This thesis further provides new perspectives on exchange-specific relationships between cornerstone commitment and the level of underpricing. Our analysis shows a more pronounced influence of the absence of cornerstone commitments on the primary exchanges in relation to underpricing rather than on secondary exchanges. Moreover, we investigate the interplay of cornerstone commitments and reputable underwriters, noting that their combination results in reduced underpricing.

The thesis is organized as follows: Chapter 2 provides further academic background of relevant topics within IPOs. Chapter 3 outlines the main data and the collection processes. Chapter 4 discusses the methodology employed to examine cornerstone IPOs and underpricing. Chapter 5 presents the empirical findings of the analysis. Finally, Chapter 6 offers a comprehensive summary.

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<sup>2</sup> Undertaking is the cornerstone commitment size as a percentage of the total IPO offer size.

## 2. Literature review

Initial public offerings have been researched extensively since the 1960s, especially with regards to initial returns and its potential determinants. Studies on underpricing related to cornerstone investors is however limited for the western markets. IPO underpricing is defined as the difference between the offer price of the issuance and the closing price of the first trading day (Loughran and Ritter, 2010). In the following section we will discuss existing literature on relevant fields within initial public offerings for our research.

### *2.1 Underpricing of IPO issuances*

The common denominator for most research conducted on IPO underpricing is that the average first-day return far exceeds the average comparable daily market return. Ritter and Welch (2002) analyzed IPOs from 1980 to 2001 and documented an average first-day return of 18.8%, leaving substantial profits available for IPO investors. This dispersion between average underpricing and daily market returns have persisted throughout different time periods and market conditions, and is one of the main reasons why underpricing of IPOs has been one of the most central finance anomalies (Loughran and Ritter, 2004).

Ibbotson (1975) attributed underpricing towards aftermarket efficiency, which has been supported by later studies. He argues that the sources of underpricing lies within investor short-term overconfidence and the effect of systematic underpricing by the underwriter and issuing firm. Overconfident investors in the secondary markets overvaluing IPO stocks can explain the long-term IPO underperformance documented by many researchers such as Loughran and Ritter (2004) and Ljungqvist and Wilhelm (2002).

Systematic underpricing is synonymous with leaving money on the table, which is tied to one of the most central explanations for IPO underpricing in finance theory, namely asymmetric information. The inequality of information held by market participants in IPO processes is believed to contribute to underpricing in equilibrium (Ljungqvist, 2007). Issuers and the underwriters are inherently more informed about the offering compared to outside investors. Rational investors will fear a lemons problem and the Winner's curse, and therefore be less willing to



participate in IPOs where they are not sufficiently informed (Ritter and Welch, 2002). Pricing IPOs at a discount in the primary market is therefore crucial in order to attract uninformed investors, assuming that demand from informed investors is insufficient to cover the offering (Rock, 1986). In addition, Lowry, Officer and Schwert (2010) argues that the volatility of returns and the actual underpricing of issuing firms are higher for issuances that are difficult to value because of higher information asymmetries. Uncertain investment prospects are inherently difficult to correctly value, and underpricing is therefore an efficient response to the complexity of investors' valuation concerns.

### *2.1.1 Cornerstone involvement as explanation for Underpricing*

The effect of cornerstone involvement on IPOs elicits divergent conclusions among researchers in the field. Zhao (2022) investigated cornerstone investments in the recent Hong Kong IPO market and found a negative relationship with the subsequent initial return. The relationship is explained by enhanced market confidence together with reduced information asymmetry, consequently mitigating required systematic underpricing. The opposite relationship however, has also been documented by McGuinness (2014) for the Hong Kong market and Engman and Pehrson (2017) for the Swedish market. Engman and Pehrson documented a 9.2pp higher underpricing for cornerstone-backed IPOs.

McNaughton (2015) argues that lower information asymmetry, signaling of confidence, and enhanced certainty for IPO completion from cornerstone involvement will positively stimulate demand. This can potentially drive price momentum, leading to excess underpricing. Espenlaub, Khursed, Mohammed and Saadouni (2015) proposed the selection hypothesis, relating higher underpricing to cornerstone investors' ability to identify the best performing IPOs, as well as their ability to provide long-term value adding effects through their expertise.

Our findings reveals an average equally weighted (EW) underpricing of 19.7% for cornerstone-backed IPOs, compared to an average of 7.9% for non-cornerstone IPOs. These results illuminate an interesting relationship, emphasizing an unexploited opportunity within IPO investment strategies.

### *2.1.2 Underwriter prestige as an IPO signaling effect*

The reputation and perceived expertise of certain underwriters taking firms public are crucial factors that influence investor perception and overall demand for the shares in the IPO (Ritter, 2002). Established underwriters with a strong track record in the capital markets can attract more interest from investors through their increased reach and larger customer base (Hansen, 2001). This reduces the uncertainty regarding the underwriter's placement problem, and therefore limits the need for systematic underpricing to attract investors in the issuance, resulting in lower levels of underpricing. These reputable underwriters are also expected to provide higher-quality information and superior valuation expertise, reducing investor uncertainty and subsequent underpricing (Carter and Manaster, 1990).

Carter and Manaster (1990) and Cooney, Singh, Carter and Dark (2001) found a negative relationship between underwriter prestige and IPO underpricing during the 1980s. Both studies unveiled a 12% higher underpricing for IPOs issued by lower ranked underwriters compared to the IPOs issued by the top underwriters. Consistent with these studies, our research uncovers a similar relationship for the Scandinavian markets. On the contrary, research conducted on the US market in the 1990s reveals a positive relationship between underwriter reputation and underpricing (Johnston and Roten, 2015), indicating changing relationships across time.

### *2.1.3 Company characteristics as explanation for underpricing*

Loughran and Ritter (2004) investigated IPOs by segmenting based on specific company characteristics such as firm age and operating industry. Their study concluded that listings from certain industries, during specific periods, have significantly higher initial returns than other industries in the same period.

In addition to this, they also revealed that younger firms tend to exhibit higher levels of underpricing than older firms. Ritter (2004) attributes underpricing related to age and industry to information asymmetries. Younger firms and IPOs of firms in relatively new or complex industries often face higher levels of information asymmetry (Megginson and Weiss, 1991). This will result in valuation uncertainties, representing a risk factor which investors will require compensation for, through underpricing (Ritter, 1984).

### *2.1.4 Market conditions as explanation for underpricing*

Ibbotson and Ritter (1995) found that both the IPO volume and average initial returns exhibit cyclical patterns by identifying serial monthly correlation. Hot IPO markets are defined as periods when the listing volume is higher compared to long-term average levels (Ibbotson and Jaffe, 1975). Ritter (1991) discovered that IPOs issued during these hot issue markets tend to exhibit higher levels of IPO returns, indicating persisting serial dependency across both returns and volume.

An increasing investor sentiment allows risky firms to raise capital more easily, leading to a change in risk composition, as proposed by Ritter (1984). The author also argues that as the risk composition of firms increases, the investors' required underpricing also increases. Rock (1982) further argues that underpricing serves as a mechanism to mitigate investors' risk concerns, establishing an equilibrium relationship between risk and expected returns in hot markets.

Following the book building process, the underwriters final decision regarding the price for the IPO issuance is dependent on the demand for the shares (Beneviste and Spindt, 1989). Beneviste argues that when investor demand for an IPO is high, underwriters are inclined to raise the offer price. Several researchers have used this framework and utilized a measure comparing the final offer price to the IPO filing range in order to examine relative IPO demand effects on underpricing. Bradley and Jordan (2002) and Hanley (1993) found evidence suggesting that IPOs priced above the midpoint<sup>3</sup> of the filing range exhibits higher levels of underpricing compared to IPOs priced at or below the midpoint.

For our research we examine the joint and simultaneous effects of market sentiment and cornerstone involvement on subsequent IPO underpricing and uncover a strong positive relationship. We utilize the previous month data in order to test for IPO serial correlation between underpricing and sentiment, building upon Ritter (1991) regarding serial dependency.

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<sup>3</sup> Priced here refers to the IPO final offer price.

### 3. Data Collection and Sample Selection

The subsequent sections provide an overview of the sample and data selection process, along with a description of our data collection methodology and sources.

#### *3.1 Sample Selection and Issue Characteristics*

Our empirical research utilized a final dataset comprising 538 Scandinavian IPOs issued from January 2010 to June 2023. To ensure comprehensive and reliable data, we employed multiple sources, including Refinitiv, SDC Platinum, and Bloomberg. We thoroughly cross-checked the data from the three sources using a matching procedure on company tickers to ensure data accuracy and consistency.

Our choice of geographical delimitations revolves around the similarities in economic, political and institutional characteristics across the Scandinavian countries. We employ a 14-year timeframe in our research to investigate diverse market conditions, including the slow IPO market of the post-financial crisis in the early 2010s, alongside the hot IPO market of the Covid-period.

Following the extraction and cross checking of IPO data from the databases, the resulting data set included a significant number of IPOs with missing data points. Concerned with having complete data for each IPO issuance, we retrieved additional information from the listing prospectuses. In order to isolate the effects of the IPO mechanism, we exclude secondary listings, SPACs<sup>4</sup>, seasoned equity offerings, spin-offs, and exchange transfers. In addition, we excluded extreme outliers where underpricing exceeded 300%. Euronext growth<sup>5</sup> issuances were retrieved manually as the data sources did not provide information regarding most of these IPOs.

Table 3.1 illustrates the distribution of initial returns based on geographic market and defined subperiods. In alignment with earlier research on the Scandinavian IPO market, our dataset constitutes a sufficient sample size for each segmentation, allowing for focused analysis of the Scandinavian IPO market.

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<sup>4</sup> SPAC: Special purpose acquisition company - Listed as a non-operating company with cash. The operating purpose of SPACs is to find and acquire another company in the future (after listing).

<sup>5</sup> Secondary exchange in Norway, previously named Merkur Market.

Country	Number of IPOs	Average underpricing	Subperiod	Number of IPOs	Average underpricing
Norway	181	15.0 %	Pre-Covid	276	9.8 %
Sweden	301	13.2 %	Covid	220	21.4 %
Denmark	56	20.3 %	Post-Covid	42	9.9 %
Total	538	14.6 %	Total	538	14.6 %

Table 3.1: Distribution of Scandinavian issuances on geography and defined subperiods: Pre-Covid (2010-2019), Covid (2020-2021), Post-Covid (2022-2023). Average underpricing is the average equally weighted first-day return of relevant IPO issuances.

Figure 3.2 emphasizes the cyclical nature of the Scandinavian IPO markets, with large variation between the most active years to the least active years, consistent with Ibbotson and Jaffe (1975). Evident from our dataset is the remarkable surge of IPO activity following the Covid-19 outbreak, sparked by expectations of an economic rebound and persisting low levels of interest rates (EY, 2021). A thriving startup scene, the deep pool of institutional investors and the fast-growing base of retail investors made capital more accessible for Scandinavian companies (S&P Global, 2021).

Low IPO volumes in the beginning of our dataset can be explained by a slow reopening of the capital markets following the financial crisis of 2008 in combination with the Euro crisis and Energy crisis during the early 2010s (EY, 2011).

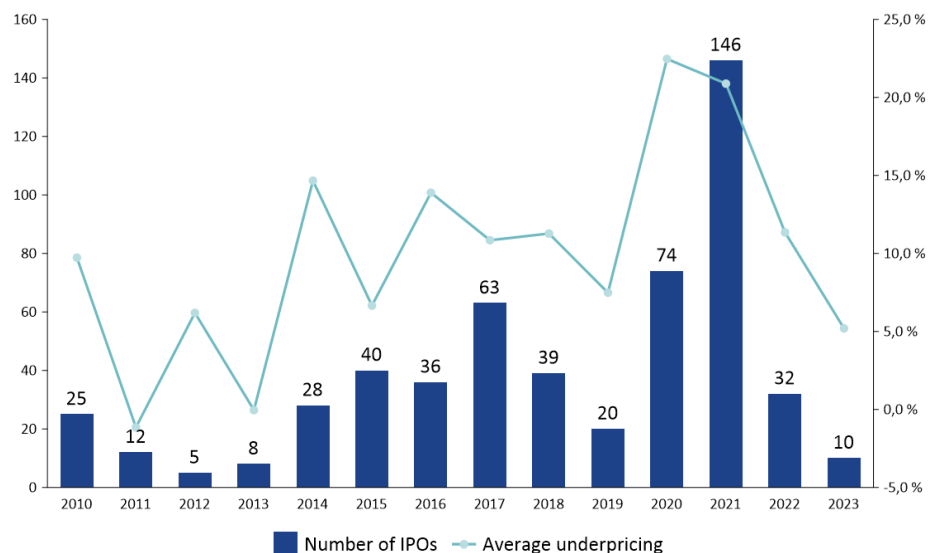


Figure 3.2: Number of Scandinavian IPOs per year between January 2010 and June 2023, alongside yearly average underpricing (line). Record year in 2020 and 2021 in terms both of IPO volume and returns.

## 3.2 Data and Variable Characteristics of Scandinavian IPOs

The following subchapters describe the construction and sourcing of variables regarding deal characteristics, firm characteristics, and market conditions.

### 3.2.1 Cornerstone Investors

In order to analyze the association between cornerstone participation and IPO underpricing, we incorporate the cornerstone variable. As research on cornerstone investments in the Scandinavian markets is fairly undocumented, there was no available database providing information regarding cornerstones for our sample of IPOs. Consequently, we uncovered cornerstone involvement by examining all IPO prospectuses. There were 304 listings with cornerstones, constituting 57% of our sample. Figure 3.3 depicts the development of cornerstone involvement.

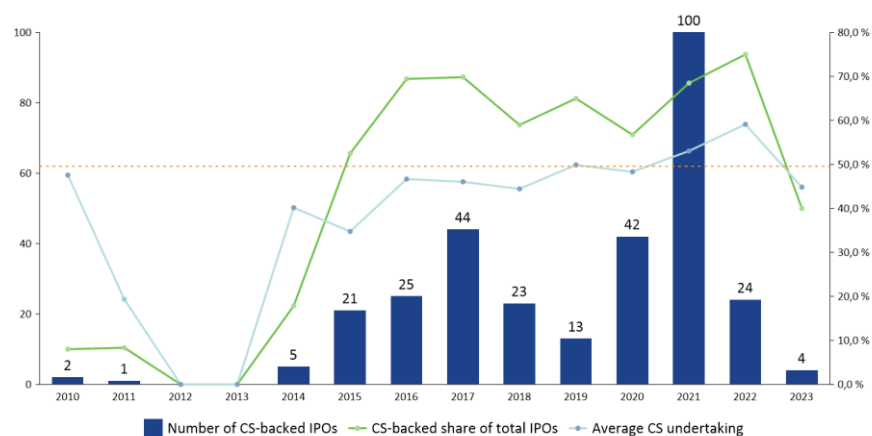


Figure 3.3: Development of Scandinavian cornerstone IPOs. The green line depicts the share of total IPOs that involve cornerstones. Blue line depicts average cornerstone undertaking. Orange line at 50% emphasizing cornerstones in the majority of IPOs since 2015. CS stands for cornerstone.

We also study the participation of cornerstone investors by considering the size of their commitment, expressed as a percentage of the total offering. This analysis allows for examining the magnitude of the cornerstone effect, attributable to the degree of cornerstone allocation. The average cornerstone undertaking ratio among the cornerstone-backed IPOs was 49% of the offer size. Table 3.4 depicts the distribution of cornerstone allocation with average underpricing.

Cornerstone IPOs - Undertaking allocation as percentage of total IPO offer size

Undertaking	0-25%	25-50%	50-75%	75-100%	Total
Number of IPOs	40	104	120	40	304
Average Underpricing	10.9 %	16.1 %	19.2 %	39.5 %	19.7 %

Table 3.4: Overview of cornerstone IPOs segmented on degree of cornerstone undertaking.

### 3.2.2 Prestigious Underwriters

The underwriter of an IPO holds a significant role throughout the entire listing process and may therefore reveal explanatory relationships with the underpricing. We utilized Refinitiv's equity offerings leaderboard to define and rank prestigious underwriters in the Scandinavian countries. To investigate the relationship between an underwriter's reputational effect on underpricing, we have included binary variables related to the lead underwriter of the IPO issuance. We distinguish between top International underwriters, top Nordic underwriters, and non-ranked underwriters. Demonstrated in Table 3.5, there is a noticeable lower underpricing associated with higher underwriter prestige, accompanied with an increased average offer size.

<b>Underwriter</b>	<b>Number of IPOs</b>	<b>Average underpricing</b>	<b>Average proceeds</b>
Top International	20	<b>11.4 %</b>	916.05
Top Nordic	337	<b>13.1 %</b>	163.34
Non-ranked	181	<b>17.6 %</b>	9.75
<b>Total</b>	<b>538</b>	<b>14.6 %</b>	<b>140.35</b>

Table 3.5: Overview of underwriter classification with average underpricing and offer size. Top International is defined as the worldwide Bulge Bracket banks. Top Nordic is defined as the top 10 Nordic based underwriters, while non-ranked encapsulates other local underwriters.

### 3.2.3 Green Companies

The Norwegian stock exchanges has experienced a notable surge in activity during recent years, especially with regards to the number of "green" companies going public, placing Norway as the number one European exchange for green firms based on activity levels in 2021 (Wiersholm, 2021). This trend has also been present in Sweden and Denmark, although slightly less prevalent. We sought to control for the seemingly high investor sentiment towards green companies, while also examining the impact of cornerstone-backing for green companies.

Despite increased interest in green investments, there is currently no universally accepted definition of a "green" company. For the purpose of our study, we classified a company as green if the entire business model was centered around environmentally improving operations. This resulted in 51 companies defined as green. In line with Wiersholm's findings, a majority of these IPOs went public during the Covid-period. Overall, the green companies yielded an average underpricing of 28.8%, considerably higher than the sample average of 14.6%.

### *3.2.4 Company specific characteristics*

In order to examine firm-specific effects related to the financial characteristics, we gathered accounting data for the period preceding the IPO. Consistent with Loughran and Ritter (2004), we control for company size through the natural logarithm of book value of assets. To examine the effect of profitability, we utilize a binary variable for EPS. Out of the dataset of 538 IPOs, 49% had positive EPS. We observe higher average underpricing among non-profitable firms.

To account for potential age-effects on underpricing, we incorporate a variable for company age at the listing date. The average firm age in our sample was 15.3 years. In our dataset, the oldest firm that went public was 170 years old, while the youngest firm was incorporated merely two weeks prior to the issuance.

### *3.2.5 Market Conditions*

The IPO market is highly cyclical, both in terms of volume and average initial returns. Demand for new issuances is subject to clustering (Lowry, 2003), while issuing firms can time their market entry based on favorable market conditions (Ibbotson and Jaffe, 1975; Çolak and Günay, 2001). Given that the Scandinavian IPO market in our sample often exhibits periods of inactivity, we devised proxies for Scandinavian market conditions utilizing US data<sup>6</sup>. The US IPO market offers a rich source of data, while also being fairly correlated<sup>7</sup> with the Scandinavian markets (see figure A2 in the Appendix for graph of US and Nordic Index).

In order to capture effects related to sentiment and demand towards IPO investments, we utilized data from Ritter (n.d.) on the monthly percentage of US listings being priced over the midpoint of the filing range as a proxy for market hotness and sentiment. A high proportion of issuers going public above the midpoint indicates a hot issue market, as the demand for new companies exceeds the amount of new capital being issued (Derrien, 2005). In addition, we included a variable utilizing the previous month's underpricing in the US, consistent with theories regarding hot markets (Ljungqvist et al., 2006) and autocorrelated initial returns (Higgins, Howton, and Perfect, 2000).

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<sup>6</sup> We also developed an in-sample measure for Hot/Cold markets by utilizing Scandinavian IPO volume. However, the high degree of inactive months resulted in the measure being non-optimal, therefore not yielding significant explanatory power for IPO underpricing. See appendix A3.

<sup>7</sup> Correlation between returns of SPX and Nordic MSCI index = 0.85. See appendix A2.



## 4. Methodology and Empirical Analysis

In the subsequent chapter, we outline the methodologies employed in our study. Our methodology is based on previous research and utilizes multiple different regression models, with the primary objective of uncovering the relationship between cornerstone involvement and IPO underpricing.

### *4.1 Method for defining and measuring underpricing*

Underpricing is defined as the percentage difference between the IPO offer price and the price at which the issued stock closes at the first day of trading, consistent with the methodology of Loughran and Ritter (2004). While older studies utilize a longer time horizon to determine underpricing, we analyze the first day returns as this reflects our focus on the initial market reaction for cornerstone involvement.

$$\text{Underpricing} = \frac{\text{Closing price} - \text{Offer price}}{\text{Offer price}}$$

When evaluating the average initial returns for our dataset, we will utilize an equal weight (EW) among the issuances. To capture the isolated effects of the IPO, we calculate the market adjusted abnormal return (MAAR) by adjusting for market movements on the issue date. This method is supported by Logue (1973) and Ritter and Welch (2002).

We uncovered an average MAAR of 14.6% for the Scandinavian IPOs, slightly lower than earlier findings from the US markets. Possible explanations for a lower observed underpricing may be attributed to a higher degree of information transparency in Scandinavian countries (U.S. News, 2022) and a different time horizon examined. The IPO data reveal that the majority of issuances exhibited positive first day MAAR, indicating a higher likelihood of gains rather than losses when investing in a single random IPO. The distribution of our IPO data indicates non-normality with positive skewness and kurtosis, which is also supported by the Jarque and Bera test. Nevertheless, this is a common tendency in the field of IPO research (Ibbotson, 1975). We performed a Wilcoxon test for our nonparametric dataset to conclude that there is a significant difference between initial returns of IPOs and daily market returns<sup>8</sup>.

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<sup>8</sup> The results of the Jarque and Bera test and the Wilcoxon test are available at request.

## 4.2 Univariate Analysis and Probit Regressions

To initiate our analysis and lay further groundwork for our methodology, we first carry out a comprehensive analysis of the cornerstone variable, yielding important insight relevant for the regression model construction.

We perform a univariate analysis of the IPO sample by distinguishing between IPOs with and without cornerstone-backing. This initial analysis serves as a foundation for investigating the impact and significance of cornerstone investors and the subsequent IPO underpricing. Building upon the univariate analysis, two-sample t-tests will be utilized to confer whether or not cornerstone-backed IPOs exhibit higher degrees of underpricing than non-cornerstone backed IPOs. T-tests will also be used to check firm characteristics, potentially revealing significant differences in the types of firms engaging cornerstone investors.

To identify potential factors determining cornerstone involvement in IPOs, we conducted a probit analysis utilizing our set of independent variables. The regression analysis yields insight into which factors that are most correlated with cornerstone involvement in IPOs. The model is defined with cornerstone involvement on the left hand side, expressed as a percentage, with the set of independent variables on the right hand side. Uncovering significant relationships between cornerstone involvement and other independent variables allows us to better analyze and understand the relationships related to cornerstone investors. The probit regression is defined as follows:

$$\text{Cornerstone} = \text{LnAge} + \text{EPS} + \text{LnOfferSize} + \text{Green} + \\ \text{Underwriter Prestige} + \text{Sentiment} + \text{MarketReturnPrev30day}$$

Findings from the probit analysis may indicate that cornerstone involvement in IPOs are not random, but a result of an investor selection process. The sample of cornerstone-backed IPOs may therefore not be randomly distributed. We utilize the Endogenous Switching Model (ESM) with OfferSize as an instrument variable to check for selection bias for the cornerstone IPOs through a 2SLS-model construction. In the absence of selection bias, we will be able to construct efficient models with unbiased regression results.

### *4.3 Multivariate regression for IPO underpricing*

Several multiple regressions have been conducted in order to analyze whether or not cornerstone involvement has robust explanatory power for IPO underpricing. The regression is modeled with underpricing, in percentage points (pp), as the dependent variable and cornerstone involvement as the exogenous variable of interest, along with a set of control variables. This regression allows for identification of specific variables and their relationship with initial returns of IPOs and cornerstone involvement. Table A1 in the appendix provides a comprehensive overview of the control variables that were examined. Equation 4.3 depicts the initial regression of cornerstone involvement and control variables.

$$\text{Market Adjusted Abnormal Return (MAAR)} = \alpha + \beta_1 * \text{Cornerstone} + \beta_2 * \text{LnAge} + \beta_3 * \text{LnAssets} + \beta_4 * \text{EPS}$$

( 4.3)

With this model as a foundation, we proceeded to perform additional analyses to assess the robustness of the variables of interest. By systematically introducing one explanatory variable at a time and examining the subsequent regression results, we evaluate the individual impact of each coefficient. This approach deepened our understanding of the relationships and also allowed for qualified model construction. We also integrate the three defined time periods into the regression model to examine how the relationships may have changed over time, while we also segment based on primary and secondary exchanges.

#### *4.3.1 Regression for Cornerstone Undertaking*

In addition to analyzing the entire set of IPOs, we also perform analysis regarding the subsample of cornerstone-backed issuances. The objective is to uncover the magnitude of explanatory power of the cornerstone presence which can be attributed towards the degree of cornerstone undertaking. Table 3.4 unveils the distinct pattern where higher cornerstone undertaking is associated with greater underpricing. To confer whether or not this relationship is robust and statistically significant for IPO underpricing, we utilize the same regression methodology as highlighted above, by including the variable Undertaking. To observe the joint impact of high cornerstone allocation and market sentiment, we also introduce an interaction term between these variables. Thereby revealing the effect of strong cornerstone signaling, conditional on high demand for new issuances.

## 5. Results

In this chapter, we delve into the results of our empirical study by analyzing and interpreting the findings. We focus specifically on the variables showing robust explanatory power for the phenomenon of IPO underpricing. A more granular perspective is provided through sample-split analysis. We devote particular attention to the degree of cornerstone allocations in IPOs.

### 5.1 Univariate regression model

The univariate analysis distinguishes the sample into IPOs with and without cornerstone involvement. The results of this analysis indicate a statistically significant difference in characteristics and initial returns of IPOs for each group. On average, IPOs with cornerstone investors experience an 11.86 percentage points higher first-day return compared to non-cornerstone backed IPOs. This difference is significant at a 1% level, making it reasonable to confer that cornerstone IPOs exhibit higher levels of underpricing. Based on theories regarding efficient markets, the presence of cornerstone commitments should in theory contribute towards a higher offer price through lower uncertainty, and subsequently lower the level of underpricing. We however, suggest that this underpricing anomaly can be explained through behavioral reasoning.

The univariate analysis in Table 5.1 reveals that cornerstone investors are more likely to be present in IPOs where the issuing firm has a higher company age and lower book values of assets. In addition, cornerstone investors are increasingly more likely to participate in IPOs when the market sentiment is high.

TABLE 5.1 Univariate Analysis - Cornerstone involvement

The definitions of the following variables are described in Appendix - Table of variables  
Significance levels at 1%, 5%, and 10% are indicated by the symbols \*\*\*, \*\*, and \* respectively

Variables	All IPOs N = 538		Cornerstone Backed N= 304		Non-cornerstone N= 234		Mean Difference CS - NCS	T-test (t-0) T
	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev		
Underpricing	14.57 %	0.39	19.73 %	0.40	7.86 %	0.36	11.86 %	7.24 ***
Company Age	15.33	18.85	15.54	18.48	15.07	19.36	0.47	0.58
Assets	544.89	2232.11	436.34	2204.11	685.91	2264.93	-249.57	(2.59) ***
Proceeds	140.35	328.28	127.68	318.12	157.06	341.25	-29.38	(2.07) **
EPS (t/0)	0.49	0.50	0.48	0.50	0.50	0.50	-0.02	(1.07)
Prestigious IB (t/0)	0.66	0.47	0.65	0.48	0.68	0.47	-0.03	(1.38)
Hot/Cold market (t/0/-1)	0.30	0.83	0.27	0.84	0.34	0.81	-0.07	(2.02) **
Sentiment	0.34	0.79	0.49	0.84	0.15	0.67	0.34	10.31 ***
Market return prev 30 day	1.13 %	0.04	1.02 %	0.04	1.27 %	0.04	-0.26 %	(1.45)

**Table 5.1:** Univariate analysis dividing the sample into two sub-groups, IPOs with and without cornerstone investors. Results indicate significant mean differences across variables.

## 5.2 Probit analysis and Endogenous Switching Model (ESM)

The results of the probit analysis reveal a strong link between investor sentiment and cornerstone presence, consistent with the results of the univariate analysis. As sentiment increases, investors tend to assume autocorrelated IPO returns (Lowry et al., 2010). This in turn lowers the anticipated risk of negative returns that cornerstone investors are exposed to. When investor sentiment is high, cornerstone investors tend to be more inclined to participate in IPO issuances, however not necessarily as an isolated effect from the market conditions. These results are statistically significant at a 1% confidence interval. The analysis also reveals that cornerstone investors are more likely to be present in IPOs with larger offer sizes, but less likely to be in IPOs taken public by top international underwriters. Results of the probit regression can be found in Table 5.2.

1st stage Probit model - Cornerstone involvement (1/0)				
Dependent variable	Coefficient	Std.error	z-value	Signf. Code
Sentiment	0.353	0.078	4.552	***
LnAge	0.064	0.055	1.172	
LnOfferSize	0.070	0.048	1.450	
EPS	-0.137	0.128	-1.076	
Green	-0.176	0.216	-0.813	
MarketReturn30day	-1.449	1.439	-1.007	
Top international underwr.	-1.012	0.392	-2.578	**

Table 5.2: Probit regression model determining cornerstone involvement as a decimal, 1-0.

This statistically significant relationship between cornerstone involvement and market sentiment, in both the probit regression and the univariate analysis, makes it necessary to conduct further analysis with concerns regarding endogeneity. The results of the ESM analysis provides no statistical evidence of an isolated selection bias and endogeneity between cornerstone involvement and market sentiment. That is, cornerstone investors do not necessarily time their IPO participation based on only the sentiment, although the variables are strongly correlated. Findings illuminate that cornerstone participation may be influenced by changes in certain company and deal characteristics, rather than directly from sentiment. While this model is a simplified method of identifying endogeneity and with an assumption that IPO Offer Size is an adequate instrument variable for cornerstone involvement and sentiment, the method allows for more confidence in the regression estimates. The results of the ESM and 2SLS can be found in Table 5.3 in the appendix.

### 5.3 Cornerstone Regression model and Analysis

Building upon the base regression model (2), Table 5.4 demonstrates the development of the cornerstone coefficient through the inclusion of new control variables, providing valuable insights into the interplay between these variables and initial returns.

Regression model for Market Adjusted Abnormal Return (MAAR)							Significance codes: *** = 1%, ** = 5%, * = 10%
Variables	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Comprehensive model
Cornerstone	0.11863*** (0.03322)	0.11619*** (0.03299)	0.12033*** (0.03290)	0.11417*** (0.03283)	0.11287*** (0.03305)	0.12334*** (0.03307)	0.11336*** (0.03312)
LnAge		-0.04085*** (0.01515)	-0.03545** (0.01527)	-0.03252** (0.01524)	-0.03368** (0.01526)	-0.03644** (0.01531)	-0.03286** (0.01528)
LnAssets		-0.01789** (0.00725)	-0.01660** (0.00724)	-0.01699** (0.00721)	-0.01577** (0.00724)	-0.01897** (0.00862)	-0.01770** (0.00859)
EPS (dummy)		0.06627* (0.03703)	0.07551** (0.03709)	0.08054** (0.03696)	0.07449** (0.03700)	0.07575** (0.03713)	0.07906** (0.03699)
Green_Comp			0.13425** (0.05751)	0.12714** (0.05729)	0.12745** (0.05748)	0.13377** (0.05793)	0.12477** (0.05771)
IPO Sentiment				0.16366** (0.06476)			0.13902* (0.06809)
HotCold_Return					0.13878* (0.07207)		0.09533 (0.07550)
Top_International underwriter						0.10050 (0.09996)	0.09371 (0.09945)
Top_Nordic underwriter						0.00419 (0.04085)	-0.00651 (0.04080)
Constant	0.07863*** (0.02497)	0.19948*** (0.04150)	0.16361*** (0.04409)	0.09063* (0.05252)	0.12819*** (0.04767)	0.15590*** (0.04594)	0.08297 (0.05441)
number of IPOs	538	538	538	538	538	538	538
Adj_R_Squared	0.02142	0.04700	0.05489	0.06436	0.05967	0.04596	0.06497

Table 5.4: Regression outputs for underpricing of the sample of Scandinavian IPOs from 2010-2023. The rows indicate which control variables have been included in the regressions. See Table A1 in the Appendix for further description of the variables.

The OLS regression analysis indicates significant and robust explanatory power for various variables across different models. Notably, the comprehensive model, incorporating the largest set of variables, demonstrates the highest explanatory power for initial returns, as evidenced by an adjusted R-squared value of 0.065. Additionally, the model achieves statistical significance with an F-statistic of 5.08, indicating evidence to suggest that the variables in the model have a meaningful impact on IPO underpricing.

We note that the R-squared of 0.08 is particularly weak, however it is consistent with previous research on IPO underpricing. Carter and Manaster (1990), Lowry et al. (2010) and Booth and Chua (1996) all uncovered low r-squared statistics. IPO underpricing has been a persisting finance anomaly which emphasizes the difficulty in building models that succeed in explaining the variations in initial returns.

### *5.3.1 The Effect of Cornerstone Involvement on IPO Underpricing*

The regression findings for the *Cornerstone* variable reveal a strong and statistically significant explanatory power for IPO initial returns. In the comprehensive model, the *cornerstone* variable demonstrates a positive coefficient of 0.113. This implies that the presence of cornerstone involvement yields a positive effect of 11.3pp on the first-day return, while controlling for the other variables in the model. Notably, the *cornerstone* variable exerts robustness and statistical significance at a 1% level across all models tested. While our data sample largely reflects the clustering of IPOs that emerged during the Covid-market, our findings still align with the pre-Covid research conducted by Engman and Pehrson (2017). They uncovered a 9.2pp higher level of underpricing among Swedish cornerstone-backed IPOs between 2014 and 2016.

The most acknowledged explanation for cornerstone-related underpricing is the signaling effect, emphasizing that cornerstone investors serve to mitigate information asymmetry (McNaughton, 2015). This concept, formally known as the certification hypothesis, was first proposed by Megginson and Weiss (1991), suggesting that reputable informed investors can act as quality validators for the IPO issuance. Through the commitment of a certain investment allocation, the cornerstone investors bestow a certification of quality on the issuing firm, lowering the information asymmetry related to the issuer. Megginson and Weiss (1991) argue that this further results in higher achieved offer prices for the issuer and therefore lower underpricing. However, our analysis, along with other research on the Scandinavian markets (Grepp and Sørensen, 2017; Engman and Pehrson, 2017), uncovered the opposite relationship, with a widening gap between the IPO offer price and the secondary market price.

The certification effect composed by cornerstone investors may however, also have certain positive effects on underpricing through behavioral explanations. The Bandwagon hypothesis proposed by Welch (1992) states that investors do not only make investment decisions based on their own information, but consider other investors' decisions as deciding information. The hypothesis argues that investors are more likely to buy stocks in a company, when observing other investors buying the same stock. Retail investors observing demand from cornerstone investors for a stock, through cornerstone commitments, may therefore be incentivized to also buy the respective IPO shares. Consequently, this amplifies the demand in the market as the information asymmetry is reduced, leading to excessive first-day underpricing (Subba, 2015). The prospects of bandwagon effects also strengthen the negotiation position of cornerstone investors, who can require higher underpricing as compensation for early commitment and helping the underwriter in creating demand for the IPO shares (Ahl and Sameni, 2017).

Increased underpricing from cornerstone involvement may also be related to a reputational mechanism known as the principal-agent theory. This concept emphasizes the investment banks' priority of systematically underpricing IPOs, especially when their key clients participate as cornerstones. The objective is to ensure these clients' satisfaction and to encourage future IPO participation (Beatty and Ritter, 1986). This theory therefore argues that cornerstones are selected for deliberately underpriced issuances. Our research does not distinguish between different types of cornerstone investors, which could reveal the degree of underpricing related to client relationships as proposed by this theory.

An alternative explanation for cornerstone-related underpricing is the selection hypothesis. This hypothesis emphasizes the superior ability of informed investors to identify and commit capital to high-quality firms prior to their IPOs (Espenlaub et al., 2015). Higher quality companies may therefore easier attract cornerstone investments. The theory proposes that certain cornerstone-backed IPOs yield a higher underpricing due to their high quality characteristic, and not necessarily as a result of cornerstone involvement. By incorporating variables associated to company quality in our regression, we strive to isolate the effect of cornerstone involvement from the company quality factor.



### *5.3.2 The Effect of Market Sentiment on IPO Underpricing*

The regression model also uncovers a statistically significant relationship between IPO sentiment and underpricing. The sentiment variable, significant at a 5% level, suggests that whenever all US listings the prior month are priced above the midpoint of the filing range, the model anticipates 13.9pp higher underpricing. This is consistent with previous research on effects related to market conditions, sentiment and hot IPO markets (Derrien, 2005). The variable depicts the degree of investor sentiment and demand towards new issuances and serves as a proxy for the market sentiment in the Scandinavian capital markets.

Ritter (2004) argues that hot IPO markets and increased investor sentiment are associated with a change in risk composition and a higher degree of riskier companies going public. However, our regression analysis reveals a statistically significant relationship for the sentiment variable, while controlling for company quality metrics. The abnormal returns observed during hot markets can therefore be attributed to other factors than a changing risk composition (Derrien, 2005).

Ljungquist, Nanda and Singh (2006) associate the IPO anomalies during hot issue markets with the entrance of exuberant irrational investors. They argue that the absence of exuberant investors during cold markets results in prices being set at fundamental value by rational investors. Amidst hot issue markets however, the surge of exuberant investors, with excessively optimistic beliefs, increases the divergence in valuations between sentiment-driven and rational investors. This in turn leads to underpricing due to heightened demand and prices in the secondary market. Our findings also align with Chen, Liu and Zhu (2021), who uncovered evidence of investor sentiment having a promoting effect on underpricing through increased demand for new shares.

As previously noted, we found a strong positive relationship between cornerstone presence and market sentiment. This could potentially impose omitted variable bias for the cornerstone variable, as the positive effect might originate from an optimistic market sentiment, rather than the isolated effect of cornerstone commitment. Nonetheless, we account for this possibility by incorporating both the cornerstone and the sentiment variable, and therefore argue that the potential omitted variable bias related to market conditions is adequately controlled for.

### *5.3.3 The Effect of Underwriter Prestige on IPO Underpricing*

Contrary to the theoretical expectations set by Carter and Manaster (1990), our results indicate that top underwriters exhibit higher levels of underpricing compared to the non-ranked underwriters. After incorporating the control variables into a common regression model, underpricing is rather predominantly explained by the company-specific variables.

The positive relationship between underwriter prestige and underpricing is consistent with findings presented by Loughran and Ritter (2004). They argue that prestigious underwriters have incentives to deliberately underprice issuances to mitigate risk in the IPO process and to induce future IPO participation. Furthermore, reputable underwriters with a broader reach and larger customer base, as noted by Hansen (2001), are likely to garner more investor interest, resulting in enhanced performance in the secondary market.

To further examine the relationship between cornerstone investors and prestigious underwriters, we included an interaction term which yielded significant results at a 10% level. When considering cornerstone-backed issuances, the analysis indicates a 5.6pp lower expected underpricing for IPOs with prestigious underwriters compared to IPOs with non-prestigious underwriters. Higher quality companies tend to more often engage higher prestige underwriters, while also being able to attract cornerstone investors. When an IPO attracts cornerstone investors, the presence of prestigious underwriters enhances the certification effect and therefore lowers the perceived risk of the issuance (Carter et al., 1998). This in turn allows the issuing firm to achieve a higher offer price.

### *5.3.4 The Wave of Green Companies in the Scandinavian Markets*

Our empirical analysis reveals a robust explanatory power for the variable pertaining to “green” firms, with a positive effect of 12.5pp. Green firms are typically associated with new innovation, lower operating history and more uncertainty in future cash flows (Ogbonna and Olubusoye, 2022). By controlling for age, assets and EPS, we strive to isolate the true effect of having a green business model. However, it is important to acknowledge that there may still exist some omitted variable bias related to company quality in the green variable, as these companies differentiate substantially from other companies.

These findings contradict previous studies on green companies with regards to significance and the degree of underpricing. Anderloni and Tanda (2017) found no significant differences when examining European green versus non-green firms from 2000 to 2014. Surprisingly, the authors also reported lower levels of underpricing for green companies compared with non-green companies. Our findings reveal an opposite relationship with underpricing, indicating either a change in green sentiment over time, or a different listing environment for green companies in Scandinavia compared to the broader European markets. The inclusion of more recent time periods in our data sample, coupled with statistically significant evidence of higher underpricing in green companies, indicates an optimistic sentiment towards these companies during the Covid-period. This is also evident from our dataset, with the majority (65%) of the green firms going public during this period.

Our findings reveal a joint effect of having both cornerstone-backing and a green business model. The interaction term included in the green analysis provides a positive effect on IPO underpricing of 4.3pp, implying that a green company will obtain an enhanced underpricing effect by attracting cornerstone investors. As these green companies are inherently associated with certain risk factors, cornerstone participation helps mitigate some of this uncertainty. This reduced uncertainty, combined with a prevailing increased sentiment towards green companies, leads to excess demand for Green IPO shares and therefore higher underpricing during the timeframe examined. Table 5.6 in the appendix provides an overview of regressions performed with interaction terms.

Furthermore, we argue that the scarce supply of publicly listed green equities attracted capital and attention towards the issuance market, leading to abnormal demand in both the issuance- and the aftermarket. These relationships emulate the situation for technology companies during the dot-com bubble, which were able to easily raise capital as a result of high investor sentiment towards the sector. These companies also exhibited record levels of underpricing (Ritter, 2004).

### *5.3.5 Controlling for Risk Compensation in IPO Underpricing*

We obtain statistically significant relationships to underpricing for LnAge and LnAssets with coefficients of -0.0329 and -0.0177 respectively. This negative

relationship is consistent with the changing risk composition introduced by Ritter (1984), where higher age and assets are associated with higher firm quality, thereby necessitating less compensation via underpricing (Megginson and Weiss, 1991). On the contrary, *EPS* has a positive relationship of 0.0791 at a 5% significance level, meaning that a company with positive *EPS* will have 7.9pp higher underpricing than a non-profitable firm, while controlling for a large set of variables. This positive relationship aligns with Ritter and Welch (2002) and Aggarwal and Rivoli (1990) findings in the pre-dot-com bubble.

By controlling for quality-measures, the model is naturally constructed to reduce the underpricing-effect proposed by the selection hypotheses. However, the included variables cannot completely control for other high-quality factors like managerial skills and long-term competitive advantages that are hard to quantify, which would point toward the selection hypothesis. Our model might therefore not be able to disregard the selection hypothesis as an explanation for cornerstone-related underpricing. Alternatively, by looking at the long-term performance of cornerstone-backed IPOs, it could be possible to test and relate underpricing to the selection hypothesis, as the long-term performance would reveal the true selection abilities of the cornerstone investors. Generally, the signaling effect remains as the most predominant explanation for cornerstone related underpricing, corroborating research from Hong Kong and China (McGuinness, 2014).

#### *5.4 Granulated sample split analysis for IPO underpricing*

In the following sections, we conduct sample split analysis, building upon the comprehensive model defined in the previous sections. Recognizing the intricate nature of IPO data and the diverse factors influencing underpricing, we employ this approach to gain deeper insight into the relationships.

##### *5.4.1 Time-specific analysis of subperiods*

To investigate temporal changes and dynamics for IPO underpricing, we segment the IPO dataset into three distinct time periods: the Pre-Covid (2010-2019), In-Covid (2020-2021) and the Post-Covid (2022-June 2023) period. This segmentation provides a detailed study of underpricing patterns amidst various market conditions. The outcomes of our regression analysis segmented into these subperiods are outlined in Table 5.7.

Temporal regression model segmented on subperiods			
Variables	Pre-Covid Model	In-Covid Model	Post-Covid Model
Cornerstone	0.09492** (0.03739)	0.14691** (0.06474)	0.10942 (0.13121)
LnAge	-0.02868 (0.01808)	-0.04808* (0.02744)	0.06306 (0.04640)
LnAssets	-0.02391** (0.08978)	-0.01399 (0.01619)	-0.02139 (0.02728)
EPS (dummy)	0.07977* (0.04289)	0.08292 (0.06849)	-0.00089 (0.13644)
Green_Comp	0.07282 (0.08825)	0.13385* (0.07610)	0.06719 (0.17270)
IPO Sentiment	0.09796 (0.08539)	0.31409* (0.17492)	-0.30053 (0.25714)
HotCold_Return	0.00368 (0.18488)	0.21694 (0.19426)	0.03987 (0.10427)
Prestigious underwriter	0.08275 (0.05167)	-0.17379** (0.07138)	0.28193** (0.12283)
Constant	0.06886 (0.06188)	0.06768 (0.15085)	-0.14965 (0.15916)
number of IPOs	276	220	42

Table 5.7: Temporal time-specific regression analysis for all IPOs, 2010-2023.

The regression results from this analysis indicate changing IPO underpricing relationships across time. Firstly, cornerstone involvement remained statistically significant at a 5% level for both the pre-Covid and Covid-period, while also providing evidence for enhanced effect of 5.2pp on underpricing during the Covid-period. The changing temporal effect of cornerstone can be attributed to a stronger certification and bandwagon effect during the hot markets of Covid. Evident during these years, was the rapidly growing retail investor base for the Scandinavian countries (AksjeNorge, 2021; SCB, 2023). Ljungqvist et al. (2006) argues that when market sentiment is optimistic, new issuances are more affected by retail investors' optimistic beliefs. For the Covid-period, this in turn enhanced the Bandwagon effect, where cornerstone participation increased the demand for shares in the secondary market.

Secondly, the regression uncovers a reversing relationship between underwriter prestige and IPO underpricing across the subperiods. In the pre-Covid period, higher prestige underwriters were associated with higher underpricing. Oppositely, IPOs during Covid exhibited a negative relationship between underpricing and

underwriter prestige. This reversed back once again in the Post-Covid period, indicating a potential normalization. This shift is statistically significant at the 5% level during the Covid- and Post-Covid period. As a higher degree of riskier firms went public during the Covid period, engaging prestigious underwriters emerged as a strategic means to signal higher quality. In this period, prestigious underwriters became synonymous with higher quality firms, hence reducing the need for systematic underpricing as a cushion against investor uncertainty about perceived risk (Ritter, 2004).

The time-specific analysis reveals a doubled effect on underpricing for green companies during the Covid period, further highlighting the increasing investor sentiment towards sustainable firms. This relationship has reversed back during the post-Covid period, potentially indicating that the optimistic green sentiment was only a temporary phenomenon.

#### *5.4.2 Analysis for Main exchange vs Secondary exchange listings*

To investigate how the model captures variations on the different exchanges, we employed two different regressions based on exchange affiliation. We classify the exchanges of Oslo Børs, Nasdaq Stockholm, and Nasdaq Copenhagen as primary exchanges, with the remaining exchanges being classified as secondary exchanges. Typically, bigger and more mature companies go public on primary exchanges, while smaller and often riskier companies head towards the secondary exchanges.

The empirical results reveal stronger effects related to cornerstone involvement on the primary exchanges compared to the secondary exchanges. These findings are contrary to the asymmetric information hypothesis, which would suggest that smaller companies, typically listed on the secondary exchanges, with higher information asymmetries, would be more inclined to benefit from the certification effect from cornerstone commitments and exchange segmentation (McNaughton et al., 2015). By further examining the characteristics of the dataset, we observe interesting relationships with regards to the effect of cornerstone involvement. Table 5.5 showcases a univariate analysis conducted on non-cornerstone-backed IPOs.

Variables	Overall		Primary Exchange		Secondary Exchange		Difference (t-O)	T-test (t-O)
	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev		
MAUR	8.65 %	0.37	1.55 %	0.27	12.35 %	0.41	-10.80 %	(4.47) ***

Table 5.5: Univariate analysis of Non-cornerstone IPOs, segmented on exchange.

The analysis emphasizes the differences between not having cornerstones on the primary exchange compared to the same effect on the secondary exchanges. Accordingly, the absence of cornerstone involvement influences IPO underpricing in varied ways, contingent upon the exchange market. Taking into account the rapid adoption of the cornerstone practice in Scandinavian markets, it is reasonable to assume that cornerstone involvement now has become the new normal and an integral part of the IPO process. In the infrequent event that an IPO does not involve a cornerstone agreement, the markets and investors may perceive this absence as a cautionary sign or a potential red flag, subsequently leading to less demand. This effect is exceptionally strong for the primary markets. We argue that the rationale for these differences among exchanges is rooted in the differing market expectations for cornerstone involvement. While a mature firm listing on a primary exchange is generally now expected to secure cornerstone investors, the analysis suggests that the market expectations for cornerstone participation are substantially lower for firms listing on secondary exchanges. See Table 5.8 in the appendix for exchange regression.

The variable for market sentiment also yields different inferences depending on the exchange segmentation. For the secondary exchanges, the model predicts a positive effect of 17.7pp whenever 100% of the US issuances in the previous month were set above the price range midpoint. This relationship is robust at a 5% significance level. In contrast, we observe a substantially lower coefficient of only 3.5pp for the primary exchange with no statistical significance. This implies that the importance of an optimistic market sentiment is especially prevalent on the secondary exchanges, when considering at IPO underpricing. Consistent with statistics from AksjeNorge and SCB (2021; 2023) regarding the significantly increased retail investor base in the secondary markets, the explanation for this exchange specific effect can be attributed to Ljungquist et al. (2006) regarding the positive relationship between the entrance of exuberant irrational investors during hot sentiment markets and excessive underpricing.

## 5.5 Looking closer at Cornerstone undertaking coverage

As our results indicate a positive, robust, and significant relationship between cornerstone involvement and IPO underpricing, we further examine the degree of explanatory power attributed towards the cornerstone undertaking. The size of the cornerstone tranche will directly impact the supply of IPO shares in the book building process, while potentially providing signaling effects towards the market.

### 5.5.1 Cornerstone Undertaking and Market Sentiment Regression

Outlined in the probit analysis in table 5.2, cornerstone participation in IPOs is strongly tied to the market sentiment. We therefore include an interaction term for the joint effect of cornerstones and market sentiment on the IPO underpricing. Table 5.9 summarizes the regression results for cornerstone undertaking.

Regression model for Market Adjusted Underpricing (MAUR)							
Significance codes: *** = 1%, ** = 5%, * = 10%							
Variables	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
HighUndertaking	0.27932*** (0.06301)	0.02059 (0.13063)	0.02618 (0.12996)	0.02031 (0.12993)	0.03328 (0.12948)	0.03966 (0.12890)	0.03979 (0.12913)
Sentiment	0.17832* (0.09089)	0.09615 (0.09735)	0.10071 (0.09684)	0.09476 (0.09688)	0.11496 (0.09697)	0.08880 (0.09742)	0.08787 (0.09843)
HighUndertaking* Sentiment		0.58718** (0.26022)	0.53612** (0.31128)	0.53341** (0.25978)	0.51029** (0.25881)	0.50850** (0.25758)	0.51028** (0.25917)
LnAssets			-0.01869** (0.00904)	-0.01485 (0.00956)	-0.02227** (0.01014)	-0.02086** (0.01022)	-0.02122* (0.01139)
LnAge				-0.02574 (0.02099)	-0.03084 (0.02105)	-0.02799 (0.02100)	-0.02802 (0.04837)
EPS					0.09493* (0.04831)	0.10184** (0.04821)	0.10164** (0.04837)
Green						0.15798* (0.08039)	0.15713* (0.08138)
Prestigious							0.00396 (0.05468)
Constant	0.07921* (0.04651)	0.11540** (0.04890)	0.17736*** (0.05713)	0.22571*** (0.06938)	0.20700*** (0.06970)	0.19043*** (0.06988)	0.18955*** (0.07104)
number of IPOs	304	304	304	304	304	304	304
R_squared	0.07245	0.08793	0.10080	0.10530	0.1168	0.1282	0.1282

Table 5.9: Regression results for cornerstone undertaking and market sentiment, indicating a strong effect on underpricing when both variables are simultaneously high. HighUndertaking is a binary variable active when the cornerstone undertaking exceeds 75% of the total IPO offer size.



The stepwise regression model reveals the statistically significant relationship between the interaction term of Undertaking and Sentiment towards the IPO initial returns across all models. The variable *HighUndertaking* is active whenever the cornerstone undertaking for the IPO exceeds 75% of the total offering, leaving less than 25% for the book building process. The model predicts that whenever the undertaking degree and the sentiment is simultaneously high, it will give rise to a remarkable enhanced effect on the IPO underpricing. The regression model estimates that this combined effect will amount to excess underpricing of an astonishing 51pp.

The excess impact on IPO underpricing primarily derives from the principles of supply and demand. The variable *Sentiment* essentially reflects relative demand for IPO issuances, while a heightened cornerstone undertaking naturally reduces the supply of IPO shares to the market. Many cornerstone agreements often incorporate lock-up provisions (McGuinness, 2014), restricting cornerstone investors from offloading the allocated shares within a certain period post-IPO.

This limited amount of tradeable IPO shares further reduces the free float and amplifies the supply-driven effects of underpricing. Issuing firms and the underwriter often engage large financial institutions or mutual funds as cornerstone investors for the IPO (Espenlaub et al., 2015). These financial players are associated with a longer investment horizon and thus a longer holding period (Field and Lowry, 2009). Similar to the effects of lock-ups, an extended holding period will decrease the immediate free float in the market, resulting in an upward pressure on the secondary market driven by an optimistic sentiment (Garfinkle, Malkiel and Bontas, 2002). Cumulative enhanced effects for aftermarket performance is therefore a reasonable anticipation.

Dorn (2009) found evidence of high sentiment periods being followed by subsequent excess demand for IPO investments among retail investors. Ljungqvist et al. (2006) argues that when retail sentiment increases, exuberant investors drive up valuation with their optimistic beliefs. This surge in demand and valuations, in combination with a particularly low supply of IPO shares, will yield an extensively strong effect on the aftermarket performance.

A higher degree of cornerstone undertaking may increase IPO underpricing through several isolated reasons. Firstly, a substantial commitment from a cornerstone investor acts as a signal of confidence in the issuing firm (BCG, 2021). When cornerstone investors are willing to take on a larger share of the offering, this helps build confidence among other potential investors. Secondly, a higher cornerstone allocation boosts certainty regarding IPO completion, thereby reducing perceived risk (Boeh and Southam, 2011).

By looking closer at the isolated effects that the degree of cornerstone undertaking exerts on IPO underpricing, we uncover supporting arguments for these relationships. Our regression analysis, in Table 5.10 in the appendix, yields statistically significant results at the 1% confidence level. The model estimates that for every 10% increase in cornerstone undertaking, underpricing rises by 3.8 percentage points.

These findings reveal the strong signaling and risk mitigating effect that cornerstone undertakings have on IPOs. McGuinness (2014) supports this relationship as he also uncovers positive associations between higher cornerstone allocation and IPO first-day returns. McGuinness' conclusions assert that as the size of the cornerstone allocation grows, it often signals high demand from well-informed investors. He contends that this amplified demand subsequently restricts retail allocations for hot or good IPO issuances. This dynamic hints at the potential for higher first-day IPO returns as a result of higher cornerstone undertaking, emphasized by information asymmetries and supply and demand mechanisms.

Despite the remarkable underpricing estimated from the combination of high sentiment and undertaking, it can be challenging to capitalize on this phenomenon from an investment perspective. As higher sentiment and increased undertaking simultaneously increases demand while reducing the supply of shares, it becomes increasingly harder for investors to obtain allocation in these IPOs. Moreover, underwriters often allocate shares in these hot IPOs to their major clients, while the remaining investors face the Winner's curse (Levis, 1990).

## 6. Concluding Remarks

In this thesis, we study the phenomenon of IPO first-day underpricing in the context of the emerging practice of involving cornerstone investors in the IPO process. Through empirical and comprehensive analysis, this thesis provides valuable insights into the dynamics between IPO underpricing and the role played by cornerstone investors. Our findings uncover that the presence of cornerstone investors on average increase the IPO underpricing by 11.3pp, complementing previous research regarding cornerstone involvement in IPOs (Espenlaub et al., 2015; Engman and Pehrson, 2017; Grepp and Sørensen, 2017). Moreover, this relationship is further strengthened with a higher degree of cornerstone undertaking.

The findings indicate that the involvement of these cornerstone investors is perceived as a signal of confidence in the issuing firm, attracting additional demand, contributing to elevated initial returns through a higher closing price in the secondary market. The underpricing can be attributed to factors such as the certification effect, the selection hypothesis, the bandwagon phenomenon, and the inverse relationship between cornerstone allocation and the immediate free float of the IPO shares. Even though cornerstone commitments are evident of higher underpricing, we ascribe this phenomenon towards relatively higher secondary prices, rather than money left on the table through lower offer prices. Cornerstone investors therefore create additional value for the issuing firm, that otherwise might not have been attainable.

Our findings can help issuers better understand the potential benefits of attracting cornerstone investors and guide investors in assessing the attractiveness of IPO opportunities. Furthermore, we believe that underwriters should carefully consider the merits of attracting cornerstone investors to build momentum in the issuance.

Further research within the field of cornerstone-backed IPOs should be devoted to the perspective of long-term performance for these companies. By exploring a longer time horizon, the findings could reveal additional insights into the sources of cornerstone-related underpricing. The scope of the study could also be expanded by differentiating between different types of cornerstone investors, such as private and institutional cornerstone investors.

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# Appendix

In the following section, we include important definitions, tables and figures relevant to our thesis, along with other informative data statistics.

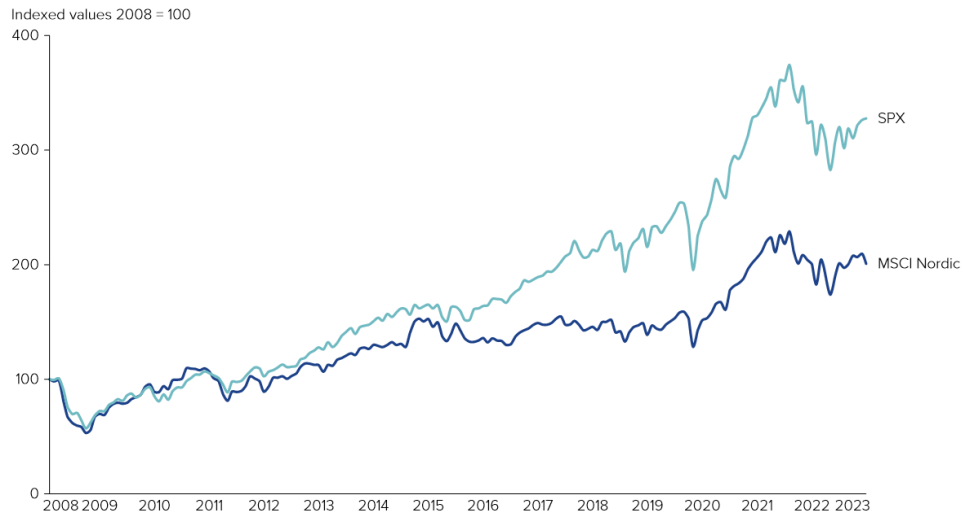
*Table A1 Description of control variables*

Variable	Description
Market adjusted abnormal return (MAAR)	The initial return subtracted by the daily market movement for the country-specific index. This variable is utilized as the dependent variable in the regressions.
Cornerstone	Binary variable with the value 1 if the issuance includes at least one cornerstone, and 0 otherwise.
Undertaking	Undertaking is the cornerstone commitment size as a percentage of the total IPO offer size.
UndertakingHigh	Binary variable with the value 1 whenever the cornerstone undertaking exceeds 75% of the total IPO offer size.
LnAge	Natural logarithm of the company age of the issuing firm on the listing date in years
LnAssets	The natural logarithm of the book value of assets for the prior fiscal period.
Green	Binary variable with the value 1 if the entire business model was centered on environmentally improving operations pre IPO, and 0 otherwise.
EPS	Binary variable with the value 1 if the earnings per share, in the prior fiscal period, is positive, and 0 otherwise.

Underwriter	The financial advisor of the issuance with the top left position on the tombstone, which is denoted as lead.
Top_International Underwriter	Binary variable with the value 1 if the IPO lead underwriter is among the top international underwriters for the nordic markets, and 0 otherwise.
Top_Nordic Underwriter	Binary variable with the value 1 if the IPO lead underwriter is among the top 10 Nordic based underwriters, and 0 otherwise.
Non-Ranked Underwriter	Binary variable with the value 1 if the IPO lead underwriter is not among either Top_International or Top_Nordic, and 0 otherwise.
Prestigious	Binary variable with the value 1 if the IPO lead underwriter is among either Top_International or Top_Nordic, and 0 otherwise.
IPO Sentiment	Utilizing monthly data on the US IPO market, we specify the percentage of listings being priced over the midpoint of the price filing range as a proxy for market sentiment and IPO demand. This is incorporated in the regression model and denoted as a percentage.
HotCold_Return	Average IPO underpricing in the US market the prior month. Denoted as a percentage.
HotCold_Volume	Binary variable with the value 1 if the IPO market is classified as hot, as defined in Figure A3 later in appendix, and 0 otherwise.
LnOfferSize	The natural logarithm of the offer size or IPO proceeds.

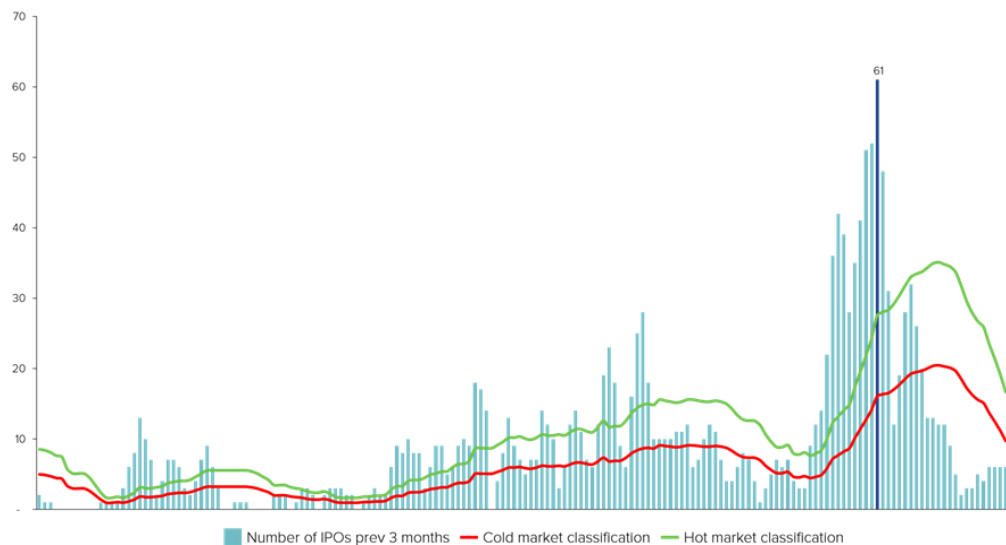
The list explains how the independent variables have been constructed and defined. Not all variables have been included in our final regression models as these were not statistically significant, or showed no interesting patterns.

*Figure A2: Correlation between MSCI Nordic and S&P 500 Index*



The figure depicts the indexed returns of the MSCI Nordic Index and the S&P 500 index. The two indexes exerts similar performance and has a correlation of 0.85. The values are indexed from June 2008 at \$100. The indexes have similar market movements, and we deem the US market as a good proxy for Scandinavian markets. Source: Bloomberg.

*Figure A3: Hot / Cold markets classification based on in-sample volume*



The figure depicts our classification and analysis of Hot and Cold markets for Scandinavia by utilizing the in sample IPO volume. We measure the monthly IPO volume, and utilize a previous 24-month moving average to determine market hotness. If the number of IPOs for the previous 3 months exceeded the previous 2-year moving average volume (divided by 8 in order to compare) by more than 20%, the given month is classified as hot. Oppositely, if the number for the previous 3 months is more than 20% lower than the previous moving average, the month is deemed as cold. Anything in between hot and cold is classified as neutral. This is included in our analysis as binary variables for HotCold\_Volume. This did not yield any significant results, and we have therefore omitted the measure. We believe this stems from several inactive months in our sample of IPOs.

*Table 5.3: Endogenous Switching Model with 2SLS construction*

Systemfit results  
method: 2SLS

System	n	DF	SSR	detRCov	OLS-R2	McElroy_R2
System	1002	988	911.666	0.307	-1.105	-0.122

	n	DF	SSR	MSE	RMSE	R2	Adj R2
Sentiment	501	494	657.220	1.330	1.153	-1.119	-1.144
Cornerstone	501	494	254.446	0.515	0.718	-1.071	-1.096

Covariance matrix of residuals		
	Sentiment	Comerstone
Sentiment	1.000	0.615
Cornerstone	0.615	1.000

Correlation matrix of residuals		
	Sentiment	Comerstone
Sentiment	1.000	0.743
Cornerstone	0.743	1.000

**2SLS estimates for 'Sentiment' (equation 1)**

Model Formula: Sentiment ~ Cornerstone + LnAssets + LnAge + EPS + Green + MarketReturn30Day  
Instruments: ~ LnOfferSize + LnAssets + LnAge + EPS + MarketReturn30Day

**2SLS estimates for 'Cornerstone' (equation 2)**

Model Formula: Cornerstone ~ LnOfferSize + LnAssets + LnAge + EPS + Green + MarketReturn30Day  
Instruments: ~ LnOfferSize + LnAssets + LnAge + EPS + MarketReturn30Day

Endogenous Switching Model performed with a 2SLS model construction, in order to check for endogeneity between Cornerstone and Sentiment. The results indicate no significant results of any endogeneity or selection bias between the two variables. It may be said that cornerstone investors do not only make their decision on investment participation in IPOs based on the sentiment. With this conclusion, we will be able to with more certainty, create efficient regression models.

*Table 5.10: Regression model for MAAR = Undertaking*

Regression model for Market Adjusted Abnormal Return (MAAR)		
Variables	Undertaking	Constant
Coefficient	0.38360***	0.00997
Std.deviation	(0.11060)	(0.05843)
R_squared	0.0383	

The regression model for cornerstone undertaking on IPO underpricing. The results indicate a statistical significant relationship, estimating that as undertaking increases by 10%, the IPO underpricing increases with 3.8 percentage points.

*Table 5.6: Regression models with interaction terms*

Regression model with interaction terms			
Variables	Green Interaction	Prestigious Interaction	Sentiment Interaction
Cornerstone	0.10608*** (0.03464)	0.19085*** (0.05690)	0.11693*** (0.03581)
LnAge	-0.03238** (0.01533)	-0.02966* (0.01528)	-0.03340** (0.01532)
LnAssets	-0.01559* (0.00839)	-0.01729** (0.00843)	-0.01514** (0.00850)
EPS (dummy)	0.07857** (0.03704)	0.08425** (0.03706)	0.07346** (0.03724)
Green_Comp	0.10217 (0.08079)	0.13280** (0.05779)	0.12881** (0.05811)
IPO Sentiment	0.13712** (0.06840)	0.14528** (0.06806)	-0.00947 (0.03793)
HotCold_Return	0.0923 (0.07556)	0.08740 (0.07541)	0.15450** (0.07857)
Prestigious underwriter	-0.00814 (0.04087)	0.06527 (0.05839)	-0.00743 (0.04080)
Interaction * Cornerstone	0.04472 (0.11148)	-0.12138* (0.06986)	-0.00318 (0.04576)
Constant	0.08534 (0.05603)	0.02751 (0.06209)	0.07997 (0.05436)
number of IPOs	538	538	538
R_Squared	0.0778	0.0827	0.0706

Table 5.6 depicts regression models for MAAR with included interaction terms between cornerstone and relevant variables. Variables include green, prestigious, and sentiment. We uncover a statistically significant relationship for the interaction term between cornerstone and prestigious underwriters, leading to an effect of 5.6pp (6.53 -12.14). In addition the green interaction term shows an additional enhanced effect of 4.5pp when an IPO is characterized by both cornerstone involvement and green business model.

*Table 5.8: Regression model segmented on primary and secondary exchanges*

<b>Regression model segmented on primary and secondary exchange</b>			
<b>Variables</b>	<b>Primary Exchange</b>	<b>Secondary Exchange</b>	<b>Both Exchanges</b>
Cornerstone	0.16547*** (0.05508)	0.11176*** (0.04059)	0.11026*** (0.03301)
LnAge	-0.00509 (0.02204)	-0.04168** (0.01837)	-0.03183** (0.01526)
LnAssets	-0.01260 (0.01293)	-0.01422 (0.01014)	-0.01560* (0.00839)
EPS (dummy)	0.11963** (0.05392)	0.06992 (0.04464)	0.07892** (0.03700)
Green_Comp	-0.03926 (0.10811)	0.14914** (0.06675)	0.12483** (0.05772)
IPO Sentiment	0.03535 (0.10716)	0.17668** (0.08060)	0.13941** (0.06811)
HotCold_Return	-0.10820 (0.17239)	0.12099 (0.08425)	0.09298 (0.07548)
Prestigious underwriter	0.21587** (0.08168)	-0.01704 (0.04717)	-0.00743 (0.04080)
Constant	-0.16760 (0.10575)	0.08863 (0.06318)	0.07997 (0.05436)
number of IPOs	112	426	538

Table 5.8 depicts a regression model segmented on subsets of IPOs based on exchange affiliation. The columns state primary and secondary exchanges, and lastly the full set of all IPOs.

## Other informative statistical tables / figures

	First-day returns		First-day returns
Average	13.9 %	Number of IPOs	501
Median	4.2 %	MAAR >= 0%	315
Standard dev.	38.0 %	MAAR < 0%	186
Minimum	-70.3 %	Kurtosis	11.05
Maximum	232.8 %	Skewness	2.67

Statistics for initial return data for the Scandinavian IPOs, 2010-2022. The results indicate a positively skewed dataset with the majority having positive MAAR.

*Table 3.6 Underwriter segmentation*

Prestigious Underwriter	Classification	Number of deals	Average Underpricing
Carnegie	Nordic	89	17.1 %
ABG	Nordic	85	5.3 %
Pareto	Nordic	37	15.1 %
SEB	Nordic	27	18.0 %
Arctic	Nordic	23	15.5 %
DNB	Nordic	23	5.8 %
Danske Bank	Nordic	18	16.7 %
Sparebank 1 Markets	Nordic	17	24.5 %
Nordea	Nordic	8	14.2 %
Swedbank	Nordic	6	8.0 %
Goldman Sachs	International	7	13.7 %
Morgan Stanley	International	5	13.9 %
JP Morgan	International	4	12.1 %
Citi, UBS, Jefferies, & Deutsche Bank	International	4	3.5 %
Total		353	14.6 %

The table depicts the underwriters classified as either Top\_Nordic or Top\_International in our dataset. We have utilized Refinitiv's league tables for Nordic equity markets to rank the top underwriters with regards to total IPO volume / offer size. Carnegie and ABG, the two most active underwriters in our dataset are responsible for about 1/3 of the IPOs.

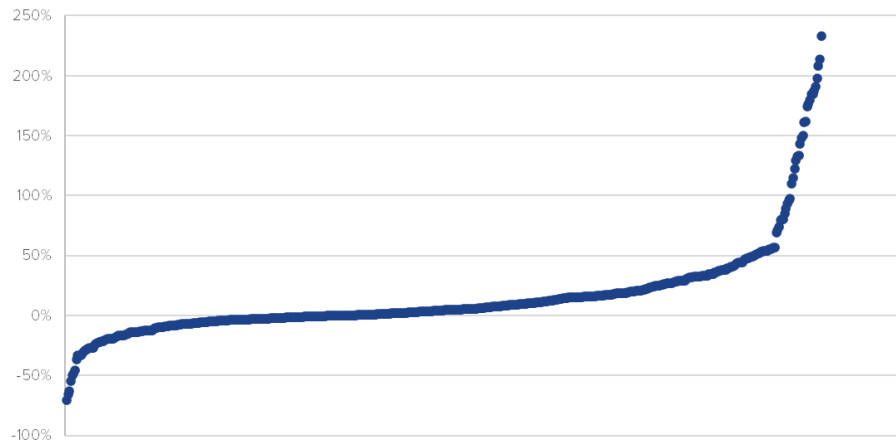
*Table 3.7 Scandinavian IPOs across industries and geography*

Industry classification (ICB)	Number of IPOs	Norway	Sweden	Denmark	Average Underpricing
Technology	149	42	84	23	15.8 %
Industrials	93	32	50	11	16.9 %
Healthcare	73	10	55	8	15.7 %
Consumer Cyclical	56	6	43	7	6.1 %
Financials	35	11	22	2	12.3 %
Energy	35	31	3	1	23.2 %
Consumer Non-Cyclicals	36	25	8	3	12.0 %
Basic Materials	21	12	9	0	14.5 %
Real Estate	21	5	16	0	7.3 %
Utilities	12	5	6	1	0.1 %
Academic & Educational Services	7	2	5	0	41.6 %
Total	538	181	301	56	14.6 %

The table depicts the Scandinavian IPOs segmented on Refinitiv's Industry Classification Benchmark (ICB). We observe the highest degree of underpricing in the Energy, Industrials, and Technology sectors. The Academic & Educational services industry has few observations and is largely affected by one outlier for the sector. We uncover no statistical significant result in our regression incorporating industry dummy variables, however we do find evidence for a green premium.

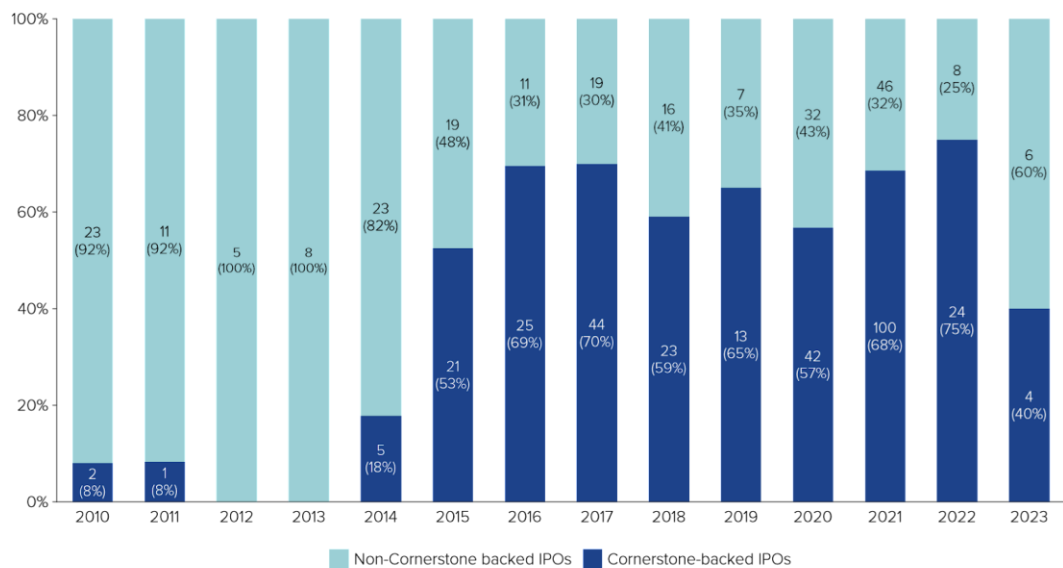


*Table 3.8 Distribution of MAAR of IPOs*



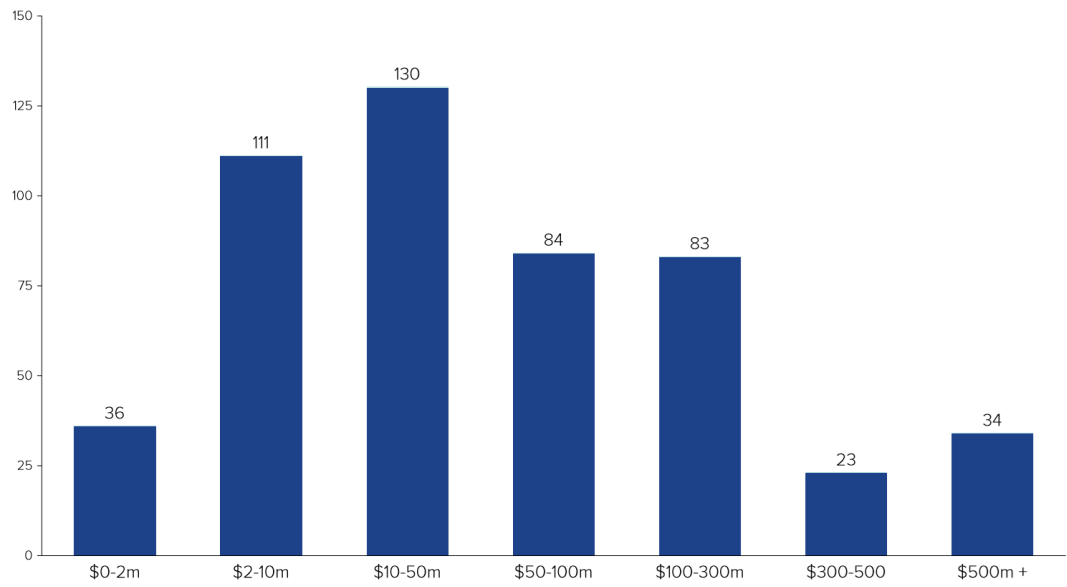
The figure depicts the distribution of MAAR for the sample of IPOs and reveals no clear outliers for the variable as the dots are close to each other on the line.

*Table 3.9 Share of Cornerstone backed and non-cornerstone backed IPOs*



The figure depicts the yearly development of cornerstone-backed and non-cornerstone backed IPOs. The data reveals that cornerstone involvement started for real in 2014. Since 2015, the majority of IPOs have had cornerstone investments.

*Table 3.10 Distribution of IPOs based on offer size (USD Million)*



Distribution of the sample of IPOs segmented on intervals of offer sizes. The most IPOs raise between 2 million and 100 million dollars.