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SCHOOL OF BUSINESS, ECONOMICS AND LAW

Bachelor's Thesis in Financial Economics

Underpricing of Venture Capital-Backed IPOs

'Evidence from the Nordics'

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Abstract

This thesis researched the effect of Venture Capital ownership on underpricing in IPOs. We conducted OLS-regressions on two data samples consisting of IPOs in the Nordics between 2009 and 2019. Two samples were collected, consisting of 504 IPOs, of which 50 were Venture Capital-backed. The second sample consisted of 50 Venture Capital-backed IPOs, where 12 IPO was exited by Venture Capitalists. Through our regressions, we found that Venture Capital-backed IPOs where less underpriced than non-Venture Capital-backed IPOs due to the certification effect. Furthermore, Venture Capital-exited IPOs were more underpriced than Venture Capital-backed IPOs, suggesting that the exit's signaling effect increased ex-ante uncertainty surrounding the IPO.

Keywords: Venture Capital, Venture Capital-backed, Venture Capital-exit, IPO, Initial Public Offering, Underpricing, Nordic Stock Market

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1. Introduction

The decision by the Nordic StartUp-unicorn Spotify to list the company at the New York stock exchange received extensive media attention when they, rather than going public through an initial public offering (hereafter IPO), did a direct listing. A direct listing is a method to take the company public by allowing current shareholders to sell their shares directly to the market (Shobhit, 2019). By choosing direct listing Spotify broke away from the traditional process of going public, different from how many StartUp-unicorns went public before (Creandum, 2016). According to McCarthy (2018), former CFO, there were several reasons for Spotify's unconventional route. However, one of the major ones was that Spotify did not want to leave money on the table, i.e., Spotify feared that the stock would be underpriced (Ibid). Spotify's concern was not unjustified since the average underpricing of Venture Capital-backed companies in the U.S. market the last 30 years has been 26,5 % (Ritter, 2020).

Spotify is just one of many prominent StartUps from the Nordics. The region has quickly emerged as a top tech-hub specializing in gaming, fintech, and cleantech (VC, 2019). Companies such as Skype, Unity, Klarna, and Rovio, are just a few examples of StartUp-unicorns that have emerged from the Nordic region, all of whom received Venture Capital funding to grow (GP Bullhound, 2019). The region has the highest rate of Venture Capital investments relative to its GDP in Europe, and investments in the region are continuously growing, led by record fundraising rounds by Nordic Venture Capital companies (VC, 2019). Prominent, examples are Creandum and Northzone that raised €265 and $500 million, respectively (KPMG, 2019). This chain of events sparked our interest into the subject of underpricing in the Nordic region, and to which extent it occurs to companies backed by Venture Capitalists.

Venture Capitalists act as financial intermediaries and redirect investments from institutional investors to private companies, which are usually StartUps (Botazzi, 2009). Even though Venture Capital is understood in layman's terms, there is no unified definition of the type of investments Venture Capital companies undertakes. However, a widely used definition are provided by Gompers & Lerner (2001):

> *"…independent, professionally managed, dedicated pools of capital that focus on equity or equity-linked investments in privately held, high growth companies."*

Since StartUps do not usually pay dividends to its equity holders, the return on investment is actualized first when the Venture Capitalists exit their portfolio company (Cumming, 2008). The most common exit type in Europe, between 2012 and 2019, has been strategic acquisitions[1]. However, when looking at the accumulated exit value, IPOs have generated the most value in absolute terms (KPMG, 2019).

Companies want to go public because capital can be raised on more favourable terms when they are traded publicly (Ritter, 1998). Before the IPO, a company is considered private and usually has a small number of shareholders, and as the stock trades publicly ownership of the company changes hands (Hayes, 2020). The IPO process intends to bridge the information gap between new and old investors when private companies offer existing and/or newly issued shares to the public *(*Ritter & Loughran, 2002). The process consists of the marketing phase where the underwriter[2] price the company and create a prospectus with all financial information of the company, and then the IPO, where the first transaction with the market takes place.

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[1] Acquisition is when a company buy most and/or all of another company's shares to achieve control of the company (Kenton, 2019).

[2] An Underwriter is a financial specialist, often an investment bank, selected by the issuer (Banton, 2019).

If the stock price of a company increases during the first trading day, the initial offer price was set too low, and the stock was underpriced. The amount of money a company gives away by underpricing is known as *'money left on the table'* (Ritter & Loughran, 2002). Ritter & Loughran (2004) define *'underpricing'* as:

> *"...the difference of the stock's closing price on the first day of trading, and its initial offered price."*

In the coming section the problem with underpricing is stated. The section continues with an in-depth discussion of the problem, why it is relevant and what implications underpricing might have. Lastly, the intent and purpose of the study are described.

1.1. Problem Statement

One of the best known abnormalities of going public through an IPO is substantial underpricing, i.e., there is a large discrepancy between the offering prices and the first day trading price of the stock (Ibbotson, et al., 1994). From the company's perspective, the high discrepancy leads to them '*leaving money on the table'*. It has led to discussions on inefficiencies in the IPO since companies give away large amounts of capital in a process designed for companies to raise money.

An ineffective process creates problems when players try to outmaneuver each other to benefit the most from an ineffective market. Venture Capitalists have been accused of not providing enough liquidity in IPOs, and some companies are reluctant to raise capital in the IPO process knowing they will pay a high price (Cumming, et al., 2005). The problem with underpricing is more severe for Venture Capital-backed IPOs where the issuers usually are young growth companies in need of capital financing to grow. From a theoretical perspective, does systematic underpricing of IPOs speak towards the market being inefficient, contradicting one of the most fundamental financial theories – *'the efficient market hypothesis'*.

1.2. Problem Discussion

Researchers of Venture Capital have long emphasized that various stages of Venture Capital-processes are interrelated and therefore is best viewed as a cycle consisting of three sequential stages; fundraising, investing and exiting (Gompers & Lerner, 2001). The problem of underpricing is related to the last stage, exiting. While strategic acquisitions are the most common exit, IPO exits typically provide higher returns and repetitional benefits to Venture Capitalists (Ibid.).

Venture capital fills the void between sources of funds for innovation and traditional lower-cost sources of capital. Successfully filling that void requires the Venture Capital industry to provide sufficient return on capital by exiting their investments and having sufficient upside-potential for entrepreneurs to attract high-quality ideas (Zider, 1998). One can argue that systematic underpricing is a market abnormality and harms both entrepreneurs and their investors (Venture Capitalists). Cumming, et al. (2005) showed that exit opportunities for Venture Capital companies affect their investment behaviour into new ventures.

While Venture Capital-backed companies are the focus of this thesis, they are used as a proxy for StartUps, i.e., innovation companies, leading economic growth and development. In the U.S., StartUps accounted for almost 50% of job creation between 1992 and 2005 and contribute significantly towards productivity growth and economic development (Decker, et al., 2014) and (Haltiwanger , et al., 2010). While the Nordics are not the same as America, the Nordic economies are amongst the most innovative in the world depending on innovation for economic growth, with Sweden ranking 2nd, according to the Global Innovation Index, and with Finland and Demark coming in at 6th and 7th (Dutta, et al., 2019). Therefore, one can argue that underpricing of Venture Capital-backed IPOs affect investment into innovation. This, in the long run, may have an impact on the economic growth of the Nordic region.

1.3. Purpose

Even though underpricing is well studied in a global context, less research has been done in the Nordic region (Ritter & Rydqvist, 1994). Earlier studies have shown systematic underpricing in the Swedish market, but only shorter time frames have been researched, for example, Abrahamson, et al. (2011). This thesis intends to extend earlier research about IPO underpricing by researching IPOs occurring between 2009 and 2019 and analyse if there is a discrepancy with IPO underpricing between Venture Capital-backed and non-Venture Capital-backed companies in the Nordic markets. Hence, our research question to answer is:

- Have Venture Capital ownership any effect on IPO underpricing in the Nordic region?

The research paper focuses on the Nordic markets due to the lack of previous research regarding underpricing of Venture Capital-backed IPOs, and since the Nordic has received limited academic attention compared to other markets when it comes to underpricing in general (Tanda & Manzi, 2020). Furthermore, there are many cultural, legal, and economic similarities between the Nordic markets, making them ideal for studying together. More specifically, the Nordic countries' financial systems display several similarities that have characterized their evolution over the past decades. The financial systems have become more stock market-centered, and the Nordic Venture Capital industry has grown in tandem with overall macroeconomic conditions and market developments (Hyytinen & Pajarinen, 2001).

The thesis will contribute to the existing body of research by extending the knowledge of underpricing of Venture Capital-backed IPOs in the Nordic region since few researchers studied underpricing in a cross-national Nordic perspective. The thesis provides additional depth by extending the scope of the study to include the effect of Venture Capital-exits within underpricing of Venture Capital-backed IPOs, something few have done before. The material can be used to compare the Nordics with more developed markets, like the French, German, or American IPO market.

2. Literature Study

This section will present previously relevant research on underpricing. The chapter will enhance the readers' knowledge about underpricing and act as the first layer for the coming analyses. The chapter end with the development of hypotheses, and the theoretical framework of underpricing is presented in chapter 3.

2.1. Literature Review

Underpricing of IPOs is not a new phenomenon. Ibbotson (1975) writes that several researchers studied the returns of common stock issued during the 1960s and 1970s. Most researchers found positive initial performance[3], while only a few found negative performance. An example is Shaw (1971), who reported negative initial returns in the Canadian market, researching the periods 1956-63 and 1968-69. Ibbotson (1975) reported an average initial return of 11,4% in the U.S., between 1960-69 but did not conclude an adequate explanation for the phenomena. The study was conducted in 1974 when markets functioned differently, making it an impure measurement since it includes up to one month's after-market performance (Ibid). Ritter & Loughran (2002) extended the previous model presented by Ibbotson (1975) and presented a new alternative explanation for underpricing. It was argued that underpricing is an indirect form of compensation to underwriters because investors are willing to offer quid pro quos to the underwriters to gain beneficial allocation on hot deals (Ritter & Loughran, 2002).

Systematic underpricing was also found in European IPO markets by Dimson & Chambers (2009) and Schuster (2002). In Sweden, foreign institutional investors had higher holdings in IPOs with higher first day returns, i.e., IPOs backed by foreign investors are more underpriced (Abrahamson, et al., 2011). The analysis indicates information asymmetry between domestic and foreign institutional investors.

[3] Ibbotson (1975) uses *'initial performance'* and *'initial return',* synonyms with underpricing.

In the Nordic region, particularly in Sweden, the high level of underpricing can partly be explained by tax avoidance. It is common for small offerings in Sweden to allocate many of their shares to employees and others with Arm's Length transactions[4]. Because of the high marginal tax rates on labor and lower tax rates on capital gains, allocating underpriced shares to employees results in lower taxes than if these individuals were compensated with wages[5] (Ritter & Rydqvist, 1994).

Ibbotson, et al. (1994) extended previous research when looking at young growth companies going public. Abnormalities were identified for IPOs of young growth companies, mainly short run underpricing and cycles in underpricing with volumes of IPOs, i.e., *'Hot and cold'* markets. The anomaly of underpricing challange the Efficient Market Hypophysis, i.e., the market's ability to price the company correctly before the company goes public, which is especially pronounced when pricing young growth companies (Ibid). Megginson & Weiss (1991) provided support for the certification model, where Venture Capitalists reduce the asymmetric information between the issuing company and investors in the IPO process. They conclude that the presence of Venture Capital investors lowers the cost of going public, and contrary to common beliefs, they retain a significant portion of their holdings after the IPO (Ibid).

While research on underpricing of Venture Capital-backed IPOs mainly focused on the American market, e.g., Bradley, et al. (2015), Franzke (2003) analysed IPOs on the German Neuer Markt between 1997 and 2002. The hypothesis was that IPOs backed by *'top VC firms'* were less underpriced due to reduced ex-ante uncertainty. However, the result showed the contrary since IPOs backed by Venture Capitalists were more underpriced than other IPOs (Ibid).

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[4] Arm's Length is a transaction without the parties influencing each other (Labarre, 2019).

[5] The role of taxes in the pricing of Swedish IPOs is discussed in detail by Ritter & Rydqvist (1994).

Further research on underpricing of Venture Capital-backed companies was conducted in the French market (Cherrak, 2012). By observing Venture Capital-backed IPOs between 1991 and 2004, it was concluded that the presence of Venture Capital firms in the IPO process will lower underpricing (Ibid). The results are in line with Megginson & Weiss (1991) and support the certification model, where the presence of Venture Capitalists signals that the company is worthwhile (Cherrak, 2012).

Bessler & Seim (2012) took a broader perspective when researching underpricing of Venture Capital-backed IPOs in 14 European countries. The results indicate positive initial returns for all years researched. It was concluded that the exit dynamics of Venture Capital firms changes during the period, due to changes in the regulatory market environment (Ibid). When looking at evidence of underpricing for Venture Capital-exits, it has been found that young Venture Capital companies are inclined to take companies public earlier than more mature Venture Capital companies (Gompers, 1996). The reason is that the Venture Capital firm wants to create a favorable reputation early in life and raise capital for new funds. IPOs from the U.S. between 1978 and 1987 show that companies going public backed by young Venture Capitalists are both younger and more underpriced compared to companies backed by more mature Venture Capitalists (Ibid).

Neus & Walz (2002) concluded that Venture Capital investors face a trade-off between selling their stake in the IPO at a discount or wait until the actual value of their investment is revealed. Venture Capitalists are certifiers in a repeated IPO game, which discards them from signal anything else than the actual value of their investment. Their findings suggest that high-quality Venture Capitalists will divest later and therefore, provide little price uncertainty (Ibid). Rossetto (2006) showed that the exit strategy of the Venture Capital investor depends on their opportunity cost, i.e., their need to free up funds for new investments. Rossetto (2006) argues that the increase in underpricing during '*hot*' issue periods is due to the arrival of highly profitable investment opportunities. When these opportunities arise, younger Venture Capitalists are more eager to raise funds through exiting via an IPO and are therefore willing to underprice their offering more (Ibid). Table 1 presented below displays a selection of empirical studies on underpricing. The table is nor exhaustive nor representative of the distribution in the data in terms of scope, geographical region, sample size, or time period.

Table 1 - Summary of Earlier Empirical Results

Research Paper	**Year**	**Research Period**	**IPO Market**	**Sample Size**	**Underpricing[1]**	**VCBC Underpricing[2]**
Ibbotson (1975)	1975	1960-1969	U.S.	N = 2 650	11,40%	-
Schuster (2002)	2002	1988-1998	Europe[3]	N = 973	16,52%	-
Ritter & Loughran (2002)[4]	2002	1999-2000	U.S.	N = 803	65,50%	-
Ritter & Welch (2002)	2002	1980-2001	U.S.	N = 6 249	18,8%	-
Dimson & Chambers (2009)[5]	2009	1917-2007	UK	N = 4540	14,57%	-
Abrahamson,et al. (2011)	2011	2000-2009	Sweden	N = 172	6,35%	-
Ibbotson, et al. (1994)	1994	1960-1992	U.S.	N = 10 626	15,26%	31,40%[6]
Franzke (2003)	2003	1997-2002	Germany	N = 300	49,81%	52,44%
Cherrak (2012)	2012	1991-2004	France	N = 136	8,58%	4,91%
Bessler & Seim (2012)	2012	1996-2010	Europe[7]	N = 384	-	8,39%
Bradley, et al. (2015)	2015	1994-2011	U.S.	N = 4 180	16,89%	53,95%

[1] Average Underpricing of IPOs.
[2] Average Underpricing of Venture Capital-backed IPOs (only included if VCBC IPOs were researched).
[3] Europe is defined as: Germany, France, Italy, the Netherlands, Spain, Sweden, and Switzerland.
[4] Following research periods were also included: 1980-1989 (underpricing = 7,4%) and 1990-1998 (underpricing = 14,8%).
[5] They also reported that the average underpricing between 1987 and 2007 was 19.00% in the UK (N = 1987).
[6] Young growth companies with annual sales of less than $1 million.
[7] Europe is defined as: Germany, France, Switzerland, Italy, Sweden, Norway, Belgium, Finland, Poland, the Netherlands, Denmark, Austria, and Portugal.

2.2. Hypothesis Development

Ritter & Rydqvist (1994) concluded that underpricing spans different geographical markets and periods. Therefore, the Nordic IPO market is expected to be underpriced, in line with findings in earlier research. Venture Capital-backed IPOs in the U.S. were underpriced to a higher degree than non-Venture Capital-backed IPOs (Ritter, 2020). Cherrak (2012) concluded that the opposite in the French market, since companies backed by Venture Capital faced lower underpricing. In a meta-study, Tanda & Manzi (2020) found that Venture Capital-backed IPOs are more underpriced than non-Venture Capital-backed IPOs. On top of that, in the German market, the one expected to be most similar to the Nordic market, Franzke (2003) showed higher underpricing of Venture Capital-backed IPOs, even if it was during the disruptive dot-com bubble. Therefore, we expect Venture Capital-backed IPOs to be more underpriced than non-Venture Capital-backed IPOs.

$H_{0,1}$: *Venture Capital-backed IPOs are not underpriced to a higher degree than non-Venture Capital-backed IPOs*

Research analysing the effect of Venture Capital-exits on underpricing of Venture Capital-backed IPOs have been sparse. Gompers (1996) showed that the IPOs of companies backed by younger Venture Capitalists were more underpriced than those backed by older Venture Capital companies. Building on the research from Franzke (2003), IPOs with at least one Venture Capital investor are presumed to have less ex-ante uncertainty due to lowered information asymmetry between new and old investors. However, if they do an exit in the IPO, the signaling effect increases the uncertainty (Ibid). Therefore we expect Venture Capital-exited IPOs to be more underpriced than Venture Capital-backed IPOs.

$H_{0,2}$: *Venture Capital-exited IPOs are less underpriced than Venture Capital-backed IPOs where no Venture Capitalist exited*

3. Theoretical Framework

The chapter intends to enhance the readers' knowledge about underpricing by presenting relevant theories explaining the phenomena of underpricing. Furthermore, theories addressing underpricing of Venture Capital-backed IPOs, as well as Venture Capital-exits, will be presented.

3.1. The Efficient Market Hypothesis

The Efficient Market theory was established by Fama (1970) and states that all current information is already reflected in the current stock price. When new information is published, investors exploit this opportunity and immediately bid the stock price up/down to a fair level and therefore, the expected rate of return will always commensurate with the risk of the stock (Ibid). Putting the efficient market theory into the context of underpricing it can be concluded that if all investors have the same information, and there is an increase in the stock's price the first trading day, the offer price was set to low, and the stock has been underpriced. However, this implicates that new information regarding the company at the time between the end of the offer day and the first day of trading, is not in favour of a higher or lower valuation of the company. Ibbotson, et al. (1994) challenge the view that the market is efficient since evidence of young growth companies being priced wrongly due to the high degree of underpricing, has been found.

3.2. Asymmetric Information

Asymmetric information refers to a situation of information imbalance where parties have different information about a situation (Berk & DeMarzo, 2016). The asymmetric information theory was developed by (Akerlof, 1970) where the author demonstrated the *'lemon problem*' which occurs in transactions with asymmetric information between the buyer and seller, which means they do not have the same amount of information when completing the transaction. In the context of IPOs, asymmetric information is one of the most common theories explaining the occurrence of underpricing. A common way to reduce asymmetric information is signaling and certification, which is presented next.

3.2.1. The Signaling Theory

The signaling theory was first developed by Spence (1973) and later applied to financial market by Leland & Pyle (1977). They showed that signaling was applicable in all situations with information asymmetry between buyers and sellers, and argued that even in markets with almost perfect information market participants would not communicate their characteristics since they might get substantial rewards for exaggerating positive qualities. To circumvent the problem, issuers with information advantage signal to outside investors by acquiring self-inflicted costs that the company's actual value is higher than the (low) average value of companies. Allen & Faulhaber (1989) argued that in an IPO, the firm best knows their prospects, and in some circumstances, companies with the most favorable outlooks find it optimal to signal their value by underpricing the IPO since outside investors know that only the best companies can recoup the cost of the signal from subsequent issues.

3.2.2. Certification Model

Information asymmetry in an IPO could be reduced by the certification model. The model assures investors of the actual value, through a third-party investor with reputational capital invested. The third-party affirm that the company is worthwhile, and if proven wrong, would be negatively affected (Megginson & Weiss, 1991). Venture Capitalists are repeat players in the IPO market since one way to realize their investment is by doing an exit through an IPO. Hence, Venture Capitalists have reputational capital invested and incentives to appear trustworthy to access the public markets on agreeable terms (Ibid). Leland & Pyle (1977) argued that financial intermediaries, like Venture Capitalists, become gatekeepers for good and bad information, and signal with their action if an issuer is worthwhile since they are experts in evaluating the risk of companies.

3.3. The Grandstanding Theory

In order for Venture Capitalists to be considered prosperous, they need to show their capability to monitor and guide their portfolio companies from the first investment to a successful exit (Hibara, 2004). The most efficient way to build a reputation is to exit through an IPO (Gompers, 1996). The grandstanding model was developed by Gompers (1993) and demonstrates that younger Venture Capital companies are more willing to sacrifice potential returns to maximize their reputation. To see the company as a lucrative investment, a potential investor must be compensated for the higher uncertainty surrounding the company (Ritter, 1987). Gompers (1996) found higher underpricing for companies that went public through an IPO at an early age. Support of this statement is also given by Ritter (1987) who explained that there is a higher degree of unpredictability of young companies going public through an IPO.

3.4. Hot and Cold Markets

When the market is considered to be '*hot*' there is a higher volume of IPOs since companies can obtain a higher offer price than when the market is '*cold*' (Ibbotson, et al., 1994). Since underwriters encourage companies to go public when the market is considered to be '*hot*', the high IPO activity may be related to higher underpricing (Ritter & Welch, 2002). The theory of '*hot*' and '*cold*' IPO markets has been used extensively in the research of underpricing of Venture Capital-backed IPOs. Although the theory is used by Ritter, (1998) and other researchers thereafter, there is no clear definition of '*hot'* or *'cold'* markets. Helwege & Liang's (2004) definition of a '*hot*' market is the most widely used, but the definition is not used universally and differs from Ritter (1987). The inconsistency in definitions of cycles in IPO markets makes it difficult to classify the difference between '*hot*' and '*cold*' IPO markets.

4. Data

The chapter begin with a short description of data collection methods. The purpose is to provide an overview of the data collection process. We will continue with an extensive introduction to our two data sets, SAMPLE I & SAMPLE II, and clarify the difference between them. Several definitions important in the collection process will be highlighted, along with general delimitations and limitations about the data. We will then highlight the data cleaning process before discussing risks associated with our data collection process. An in-depth description of the variables used in our models are provided in Chapter 5.

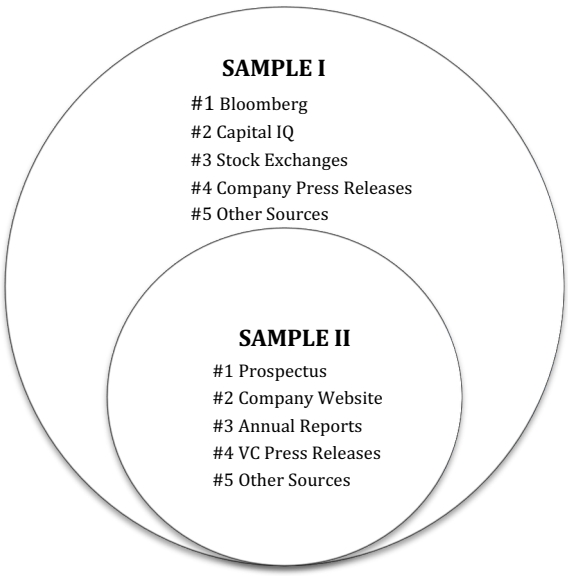
4.1. Data Collection

Following the process used by Cherrak (2012) when studying Venture Capital-backed IPOs, all IPOs conducted in the Nordic region between 1st January 2009 and 1st January 2019 were collected. In other words, companies from the Nordics that conducted their IPOs in other regions are not included in our data sets, and companies based outside the Nordic region that conducted their IPOs on stock exchanges in the Nordics are included in the data set.

To extend the research of Cherrak (2012), and provide an additional dimension of Venture Capital-backed underpricing in the Nordic region, the data collection process was carried out in two stages. First, SAMPLE I was collected from the Bloomberg Terminal database. Bloomberg classified which IPOs were Venture Capital-backed and which ones were Venture Capital-exited, and Bloomberg's excel add-in was used to collect stock market data about the issuing companies. To add missing data, additional information from S&P Capital IQ, the websites of stock exchanges, press releases, and miscellaneous sources were collected. In the second stage, all non-Venture Capital-backed IPOs were removed from the data set to construct SAMPLE II, consisting of all Venture Capital-backed IPOs conducted in the Nordics between 2009 and 2019. Prospectus and documents related to the IPO were manually downloaded from issuers websites, stock exchanges, and regulating authorities to collect IPO-specific data. Additional information from companies' websites, their annual reports, press releases and reports from Venture Capitalists, and miscellaneous sources were collected.

As described in figure 1 below, SAMPLE II is a subsample of SAMPLE I. It, therefore, includes all variables from SAMPLE I. The figure describes the relationships between the two data sets and their respective data collecting process.

Figure 1 - Relationship Between Data Sets



4.2. Data Cleaning

The initial data set collected through Bloomberg included 519 observations. Apart from stock exchanges and MTFs, Bloomberg included IPOs from Norge OTC, a trading platform owned by Oslo Børs. Since Norge OTC is not a regulated market, six observations were removed. To further clean the data, five observations were removed due to being dual listings. Three observations were data was missing for the data points; subscription price, open price on IPO date, close price on IPO date, week, two weeks, and month after IPO date, were removed. One duplicated observation was removed. Lastly, missing values were replaced with the mean value and *winsorized* at the 1st and 99th level. When *winsorizing*, the non-missing values of a variable are ordered and replaced with the highest/lowest non-outlier value (Barnett & Lewis, 1994). The final size of the cleaned data set was 504 observations, where 50 were backed by Venture Capital, and 12 were Venture Capital exits. Table 2 displays the effect of data adjustments on the sample size for SAMPLE I and SAMPLE II.

Table 2 - Effect of Data Cleaning

VCBC stands for Venture Capital-backed company. The company is considered to be Venture Capital-backed if at least one Venture Capital company is among the 10th largest shareholders. **Non-VCBC** are companies not backed by Venture Capital. **VCEX** are companies where at least one of their Venture Capital owners exits in the IPO. **Non-VCEX** are companies where Venture Capital owners do not sell their stake in the IPO.

Adjustments	**SAMPLE I**			**SAMPLE II**		
	VCBC	Non-VCBC	TOT	VCEX	Non-VCEX	TOT
Blomberg Data Set	53	467	519	13	40	53
Removed Norge OTC	52	462	514	13	39	52
Removed Dual Listings	52	457	509	13	39	52
Removed Missing Values	51	455	506	13	38	51
Removed Duplicates	50	455	505	12	38	50
Final Sample	**50**	**454**	**504**	**12**	**38**	**50**

4.3. Limitations & Risks

Limitation of the thesis includes IPOs in the Nordic region between 2009 and 2019. The period was chosen to exclude the unraveling market events of the early 21st century, the dot-com bubble from 1998 to 2001, and the financial crisis of 2007-2008. Furthermore, the classification of data is done by Bloomberg. Therefore, there could be IPOs conducted in the Nordics, in our time frame, that are not included in our data set. The same risk extends to the classification of Venture Capital-backed and Venture Capital-exited IPOs, making it the most notable identified risk. The Bloomberg Terminal kept the data set mostly intact. However, more variables were missing when data was collected using the Bloomberg Excel add-in, ranging between 10 and 189 missing values (of 504 observations). Most missing data were collected manually from various sources. Prospectus of SAMPLE I, that consist of 504 IPOs, was not analysed to conclude if Bloomberg identified all Venture Capital-backed and Venture Capital-exit IPOs accordingly. Although prospectus for the 50 Venture Capital-backed IPOs were analysed, and inconsistencies were identified. One observation was not Venture Capital-backed, and one where investor-type could not be identified, and therefore the observation was excluded. Human error cannot be neglected when collecting data manually, nor can the risk of trusting data provided by data providers.

5. Method

In this chapter, we start by displaying the calculation used to calculate our dependent variable, underpricing. We will continue to discuss the methodological course of action by a short justification for using OLS as our statistical model of choice, applied to examine underpricing of Venture Capital-backed IPOs. The purpose is to give the reader a theoretical introduction to the models that will be used.

5.1. Fundamentals

To ensure the quality of the thesis, have calculations of underpricing been constructed manually, for both SAMPLE I and SAMPLE II. According to Beatty & Ritter (1986), the calculation of underpricing does not require market movement adjustments since the offer price generally is decided upon within a couple of days of the IPO. On the other hand, Eckbo, (2007) writes it is important to adjust for market movement when calculating underpricing in some markets where there is a substantial delay between pricing and the IPO, Finland is mentioned as an example.

The average number of days between the announcement date and the IPO date was 40 days for SAMPLE I and 35 days for SAMPLE II, suggesting market movement should be adjusted for, which is consistent with the method used by Cherrak (2012). Underpricing is calculated as the return of investment for asset *'i'* on *'t'* days after the IPO day. The return on investment is defined as the percentage change from the offer price to the first trading day, week, two weeks, or the first month's open/closing price. To adjust for market movement in period *'t'* days after IPO day, the MSCI Nordic Index is used as a proxy for the Nordic market, for a detailed description of the index see Appendix p.44. The calculation is displayed in *Equation 1*.

Equation 1 - Underpricing

$$Underpricing_{i,t} = \frac{P_{i,t} - SP_{i,0}}{SP_{i,0}} - \frac{M_t - M_0}{M_0}$$

$P_{i,t} = Open/closing\ price\ for\ stock\ 'i'\ on\ 't'\ calender\ days\ from\ IPO$
$SP_{i,0} = Subscription\ price\ for\ stock\ 'i'$
$M_t = Open\ value\ for\ the\ market\ index\ on\ the\ day\ 't'\ after\ the\ IPO$
$M_0 = Closing\ value\ for\ the\ market\ index\ the\ day\ before\ IPO$

5.2. Ordinary Least Squares Model

To quantitatively examine underpricing of Venture Capital-backed IPOs, the statistical analysis relies on the OLS regression model. The model has been used extensively in financial research, with the most known example being the Capital Asset Pricing Model (Corporate Finance Institute, u.d.). OLS regressions are used to estimate the relationships between a dependent variable and one or more independent variables. The simplest model possible should be used to estimate statistical relationship, and only when necessary, should a more complex model be used (Ibid). In our study, estimating the relationship between Venture Capital-backed IPOs and underpricing, the model is adequate.

The OLS regression model is a common method when regressing underpricing on different variables. Loughran et al. (1994) use the method to determine underpricing of IPOs, Abrahamson, et al. (2011) to analyse underpricing of Swedish IPOs and Cherrak (2012) to research underpricing of Venture Capital-backed IPOs in the French market. The statistical representation of the model is displayed underneath.

Equation 2 – The OLS Regression Model

$$Y = \beta_0 + \Sigma_{j=1..p}\, \beta_j X_j + \varepsilon$$

Models was created and applied to SAMPLE I to test if there was a significant difference between Venture Capital-backed and non-Venture Capital-backed IPOs on underpricing. Models was created and applied to SAMPLE II to test if there was a significant difference in the effect of Venture Capital-exited IPOs and non-Venture Capital-exited IPOs on underpricing. The explanatory variables are used to test our model and distinguish the relationship between the dependent and independent variables. Control variables are used to control for other effects than the one researched. The variables used in our models are presented in detail in the comming section.

5.2.1. SAMPLE I

The sample was used to test if Venture Capital-backed IPOs are underpriced to a higher degree than non-Venture Capital-backed IPOs. The dependent variables, the explanatory variables, and the control variables for SAMPLE I have been replicated from Cherrak (2012), who conducted a similar study on the French market, but our variables were adapted to Nordic conditions. Referenced to Derrien & Degeorge (2001) *Venture Capital Ownership* and *Venture Capital-exit* (at IPO) is defined by a binary variable. The variable *VC Ownership Before* and *VC Ownership After* is continuing variables that measure the percentage of capital held by the Venture Capital investors before and after the IPO. The variables were used by Megginson & Weiss (1991) and measured the importance of Venture Capital commitment. The variable, *VC Ownership After*, also considers the signaling effect of Venture Capitalists by their financial commitment. A summary of the control variables is presented in table 3.

Table 3 - Control variables used in regressions of SAMPLE I

Variable	***Description***
Characteristic of Firm	
▪ *Age*	Company age at IPO
▪ *Revenue*	Revenue before the IPO date in million euros
▪ *Market cap*	Market capitalization at the day of IPO in million euros
▪ *Technology*	Binary variable if the company belongs to a technological sector
Characteristic of Offer	
▪ *% Created Stocks*	The ratio of the newly issued stocks compared to total shares after the IPO
▪ *Prestige*[1]	Binary variable if the lead underwriter is considered prestigious
▪ *MTF*	Binary variable if the company listed on an MTF and not a stock exchange
Market Conditions	
▪ *Market Return*	The market return 90 days prior to the IPO using the MSCI Nordic Index
▪ *Market Volatility*	The market volatility 30 days prior to the IPO
▪ *Hot & Cold*[2]	Binary variable if the IPO was conducted in a '*hot*' period

[1] The lead advisor is prestigious if they have more than 5% market share, according to Bloomberg, see table 14 in Appendix.
[2] A '*hot*' period is if the IPO was conducted in a period of high IPO volume. For our sample, a '*hot*' period is if the IPO was conducted between the years 2015 and 2018.

5.2.2. SAMPLE II

The sample was used to test if Venture Capital-exits in the IPO affect underpricing of Venture Capital-backed IPOs. SAMPLE II is an extension of the original empirical work. Therefore, the dependent variable is the same as in SAMPLE I. However, the explanatory variable was constructed through inspiration from Conradson & Eskilsson (2016). With reference to (Derrien & Degeorge, 2001), the explanatory variable *Venture Capital-exit* is constructed as a binary variable, in the same way as in SAMPLE I. The variable *Venture Capital Exit Size* is a continuing variable that measures the percentage of capital sold by Venture Capital investors in the IPO and was used by Conradson & Eskilsson (2016). The control variables used for SAMPLE II were extended to include variables specific to Venture Capital-backed IPOs and are, therefore, a combination of the ones used by Cherrak (2012) and Conradson & Eskilsson (2016). A summary of the variables is presented in table 4.

Table 4 – Control variables used in regressions of SAMPLE II

Variable	***Description***
Characteristic of Firm	
▪ *Age*	Company age at IPO
▪ *Market cap*	Market capitalization at the day of IPO in million euros
▪ *Comp. Stage*	Age of the company at first Venture Capital investment
▪ *VC Experience*	Age of the oldest Venture Capital investor at IPO
▪ *#VC Investor*	Number of Venture Capital investor with ownership in the company at IPO
▪ *Domestic investor*	Binary variable if Venture Capitalist is a domestic investor
▪ *Foreign Investor*	Binary variable if Venture Capitalist is a foreign investor
▪ *Technology*	Binary variable if the company belongs to a technological sector
Characteristic of Offer	
▪ *Prestige*[1]	Binary variable if the lead underwriter is considered prestigious
▪ *MTF*	Binary variable if the company listed on an MTF and not a Stock Exchange
▪ *Lock-up*	Binary variable if the Venture Capitalists have a lock-up agreement
Market Conditions	
▪ *IPO Market*	Number of IPOs done in the Nordics the same year as the IPO
▪ *Market Return*	The market return 90 days prior to the IPO using the MSCI Nordic Index
▪ *Market Volatility*	The market volatility 30 days prior to the IPO
▪ *Hot & Cold*[2]	Binary variable if the IPO was conducted in a '*hot*' period

[1] The lead advisor is prestigious if they have more than 5% market share, according to Bloomberg, see table 14 in Appendix.
[2] A '*hot*' period is if the IPO was conducted in a period of high IPO volume. For our sample, a '*hot*' period is if the IPO was conducted between the years 2015 and 2018.

6. Results & Analysis

The chapter starts by providing descriptive statistics about the data set, followed by the results from our regressions. The results will be analysed based on the information presented in the theoretical framework and previous empirical findings. The chapter ends with a discussion about the statistical validity of our methodological approach.

6.1. Descriptive Statistics

In this section, the average, median, and frequencies of our variables will be presented. Three different tests were conducted to test if the difference between the subgroups were significant. To test the equality of means a standard *student T-test* was used, to test the equality of medians the *Mann-Whitney-Wilcoxon* test was used, and to test the equality of frequencies the non-parametric *Pearson's Chi-Square* test was used. Significance helps to quantify if a result of statistical tests is due to chance or to some factor of interest, i.e., if a result is significant then the result has explanatory power to some extent (Gallo, 2016). Table 5 present parametric and non-parametric tests for SAMPLE I consist of Venture Capital-backed and non-Venture Capital-backed IPOs.

Table 5 - Venture Capital Backing and Characteristic of Newly Listed Firms

Y is a dummy that takes the value 1 when a company is backed by Venture Capitalist(s), 0 otherwise. ***Age***, age of the company at the date of IPO. ***Revenue***, revenue before the IPO date (in million euros). ***Market cap***, market capitalization (in million euros) of the company on the day of IPO. ***% Created Stocks***, the ratio of the number newly issued stocks in terms of the number of shared subjected to IPO. ***Market Return***, the MSCI market return 90 days prior to the IPO. ***Market Volatility***, the market volatility thirty days prior to the IPO. ***Technology*** equals 1 if the company belongs to technological sector**.** ***Hot & Cold***, equals 1 if the IPO was in a '*hot*' period. ***Prestige*** equals 1 if the lead underwriter in the IPO was prestigious. ***MTF***, equals 1 if the company was listed on an MTF.
Asterisks indicate the thresholds of statistical significance (* = 10%, ** = 5% and * = 1%).**

Variables	**Y = 1 VCBC**			**Y = 0 NVCBC**			**Equality of Means** T-Student		**Equality of Medians** Mann-Whitney-Wilcoxon	
	Number	**Average**	**Median**	**Number**	**Average**	**Median**	**t**	**Sig**	**Z**	**Sig**
Characteristic of Firm										
Age	50	11	10	454	22	11	2,32	0,02**	2,23	0,03**
Revenue	50	19,39	4,81	454	36,50	4,81	1,46	0,14	2,22	0,03**
Market cap	50	128,89	39,53	454	172,51	45,86	0,99	0,32	1,32	0,19
Characteristic of Offer										
% Created Stocks	50	34,25%	35,71%	454	34,82%	32,34%	0,26	0,79	- 0,98	0,33
Market Conditions										
Market Return	50	1,62%	1,79%	454	1,69%	1,54%	0,08	0,93	0,061	0,95
Market Volatility	50	10,37	8,88%	454	12,31%	11,11%	2,42	0,01**	2,83	0,00***

Variables		Y = 1 VCBC				Y = 0 NVCBC				Equality of Frequencies Pearson's Chi-Square	
	N	Num	Sample	Abs	Freq%	Num	Sample	Abs	Freq%	Chi^2	Sig
Technology	504	50	Tech = 1 Tech = 0	10 40	20,00% 80,00%	454	Tech = 1 Tech = 0	63 391	13,88% 86,12%	1,36	0,24
Hot & Cold	504	50	h&c = 1 h&c = 0	47 3	94,00% 6,00%	454	h&c = 1 h&c = 0	290 164	63,87% 36,13%	0,02	0,89
Prestige	504	50	Pres = 1 Pres = 0	17 33	34,00% 66,00%	454	Pres = 1 Pres = 0	150 304	33,04% 66,96%	18,23	0,00***
MTF	504	50	MTF = 1 MTF = 0	33 17	66,00% 34,00%	454	MTF = 1 MTF = 0	248 206	54,62% 45,38%	2,45	0,12

Venture Capital-backed companies are introduced earlier to public markets since the difference between the groups is significant at the 5 percent level. On average Venture Capital-backed companies are half the age of non-Venture Capital-backed companies when they go public. The median value for the coefficients *Age* is similar between the two groups, which indicates that Venture Capital-backed companies are more concentrated to the average value. In contrast, the non-Venture Capital-backed group has a broader range of ages.

Since there is a significant difference between average and median *Market Volatility* for the groups, at the 5 and 1 percent level, it can be concluded that there are different market conditions at the time of the IPO for Venture Capital-backed and non-Venture Capital-backed companies. This is further shown by the distribution of the variable *Hot & Cold*, where the Chi^2-test did not result in significance since 94 percent of the Venture Capital-backed IPOs were carried out in '*hot*' markets compared to 64 percent for non-Venture Capital-backed companies. There are similar distributions of prestigious underwriters between the two groups, since the Chi^2-test is significant at the 1 percentage level. This means that Venture Capital investors are not a determining factor when choosing underwriters. Table 6 compares the initial underpricing of Venture Capital-backed and non-Venture Capital-backed companies by presenting parametric tests for SAMPLE I.

Table 6 – Comparison of Underpricing of Different Time Periods

Y is a dummy that takes the value 1 when a company is backed by Venture Capitalist(s), 0 otherwise. Initial underpricing is also known as return on investment, see equation 1. ***Open*** is the percentage difference from the offer price to the first day of trading open price. ***Close*** is the percentage difference from the offer price to the first day of trading closing price. ***Week***, ***Two Week*** and ***Month*** is the percentage difference between the offer price and the closing price of the time periods. **Asterisks indicate the thresholds of statistical significance (* = 10%, ** = 5% and *** = 1%).**

Variables	**Y = 1 VCBC**			**Y = 0 NVCBC**			**TOT**			**Equality of Means** T-Student		**Equality of Medians** Mann-Whitney-Wilcoxon	
	Number	**Average**	**Median**	**Number**	**Average**	**Median**	**Number**	**Average**	**Median**	**t**	**Sig**	**Z**	**Sig**
Initial Underpricing													
Open	50	4,81%	3,92%	454	10,13%	3,85%	504	9,60%	3,85%	1,37	0,17	0,64	0,52
Close[1]	**50**	**0,40%**	**1,11%**	**454**	**9,94%**	**2,21%**	**504**	**8,99%**	**2,14%**	**2,09**	**0,04****	**1,19**	**0,23**
Week	50	- 1,05%	- 0,76%	454	12,77%	1,96%	504	11,39%	1,86%	2,31	0,02**	1,57	0,12
Two Week	50	0,42%	- 1,64%	454	14,20%	1,87%	504	12,83%	1,27%	2,00	0,05**	1,59	0,11
Month	50	- 2,31%	- 0,73%	454	13,33%	1,28%	504	11,78%	1,04%	2,29	0,02**	1,59	0,11

[1] Underpricing calculated according to the definition by Ritter & Loughran (2004), also called *first-day retur*n.

Even though there is a difference between underpricing for *Open,* no significant difference between the groups was reported by the test. For other time periods, the difference is significant at the 5 percent level. The most likely explanation is that the market function has not yet had the opportunity to price the security in the *Open* price. Underpricing of Venture Capital-backed companies for *Week*, *Two Week,* and *Month* after the IPO, are lower than the underpricing of the non-Venture Capital-backed companies. The average underpricing of Venture Capital-backed companies is 0,40% looking at *Close*. In comparison, the average for the non-Venture Capital-backed companies is 9,94%. The difference is significant at the 5 percent level. The lower underpricing of Venture Capital-backed IPOs speaks for reduced information asymmetry between new and old investors in the IPO. This was also reported by Cherrak (2012) in the French market and will further be analysed in our regressions. Table 7 presents parametric and non-parametric tests for SAMPLE II, consisting of Venture Capital-exited and non-Venture Capital-exited IPOs.

Table 7 – Venture Capital Exiting and Characteristics of Newly Listed Firms

Y is a dummy that takes the value 1 when a Venture Capitalist(s) sells shares in the IPO, 0 otherwise. ***Age***, age of the company at the date of IPO. ***Market cap***, market capitalization (in million euros) of the company on the day of IPO. ***Comp. Stage***, age of company at first Venture Capital investment. ***VC Experience***, age of the oldest Venture Capital investor at IPO. ***#VC Investors***, number of Venture Capitalists that have ownership in the company. ***IPO Market*** is the number of IPOs done in the Nordics the same year as the IPO. ***Market Return***, the MSCI market return 90 days prior to the IPO. ***Market Volatility***, the market volatility 30 days prior to the IPO. ***Lock-Up***, equals 1 if the Venture Capitalist(s) has a lock-up period in the IPO. ***Domestic Investor*** equals 1 if there are any domestic Venture Capitalists as shareholders. ***Foreign Investor*** equals 1 if there are any foreign Venture Capitalists as shareholders. ***Technology*** equals 1 if the company belongs to the technological sector. ***Hot & Cold***, equals 1 if the IPO was in a '*hot*' period. ***Prestige*** equals 1 if the lead underwriter in the IPO was prestigious. ***MTF***, equals 1 if the company was listed on an MTF.
Asterisks indicate the thresholds of statistical significance (* = 10%, ** = 5% and * = 1%).**

Variables	**Y = 1 VCEX**			**Y = 0 NVCEX**			**Equality of Means** T-Student		**Equality of Medians** Mann-Whitney-Wilcoxon	
	Number	**Average**	**Median**	**Number**	**Average**	**Median**	**t**	**Sig**	**Z**	**Sig**
Characteristic of Firm										
Age	12	17	14	38	9	8	- 2.82	0,01***	- 2.77	0,01***
Market cap	12	315,50	141,86	38	69,96	20,46	- 2.93	0,01***	- 3.81	0,00***
Comp. Stage	12	11	8	38	4	2	- 2.67	0,01**	- 2.93	0,01***
VC Experience	12	14	12	38	17	15	1.18	0,25	0.64	0,53
#VC Investors	12	1	1	38	2	2	2.54	0,02**	2.13	0,03**
Market Conditions										
IPO Market	12	97	105	38	94	105	- 0.28	0,79	0.40	0,69
Market Return	12	0,247%	0,76%	38	2,06%	2,11%	1.44	0,16	1.19	0,23
Market Volatility	12	8,84%	10,15%	38	10,44%	8,89%	0.22	0,83	0,51	0,62

Variables	**Y = 1 VCEX**					**Y = 0 NVCEX**				**Equality of Frequencies** Pearson's Chi-Square	
	N	**Num**	**Sample**	**Abs**	**Freq%**	**Num**	**Sample**	**Abs**	**Freq%**	**Chi²**	**Sig**
Lock-Up	50	12	Lock = 1 Lock = 0	12 0	100,00% 0,00%	38	Lock = 1 Lock = 0	33 5	86,84% 13,16%	1,75	0,18
Domestic investor	50	12	Dom = 1 Dom = 0	8 4	66,67% 33,33%	38	Dom = 1 Dom = 0	35 3	92,11% 7,89%	4,90	0,027**
Foreign investor	50	12	For = 1 For = 0	7 5	58,33% 41,67%	38	For = 1 For = 0	11 27	28,95% 71,05%	3,42	0,06*
Technology	50	12	Tech = 1 Tech = 0	3 9	25,00% 75,00%	38	Tech = 1 Tech = 0	7 31	18,42% 81,58%	0,25	0,62
Hot & Cold	50	12	h&c = 1 h&c = 0	11 1	91,66% 8,34%	38	h&c = 1 h&c = 0	36 2	94,74% 5,26%	0,15	0,70
Prestige	50	12	Pres = 1 Pres = 0	10 2	83,33% 16,67%	38	Pres = 1 Pres = 0	7 31	18,42% 81,58%	17,12	0,00***
MTF	50	12	MTF = 1 MTF = 0	1 11	8,33% 91,67%	38	MTF = 1 MTF = 0	32 6	84,21% 15,79%	23,40	0,00***

Issuers of Venture Capital-exited IPOs are, on average, twice as old as issuers in non-Venture Capital-exited IPOs, 17 compared to 9 years, while the median age is 14 compared to 8. The differences are significant at 1 percent level. The results speak for a broader range of ages for Venture Capital-exited issuers.

There is no significant difference for the variable *Hot & Cold*, but a majority of the Venture Capital-exited IPOs are done in a '*hot*' period. Prestigious underwriters are more common for Venture Capital-exited IPOs since they are larger in size, and since investors are planning to exit in the IPO, it is natural to look for more prestigious underwriters. Lastly, most exits occurred at major stocks exchanges, which is not the same for non-Venture Capital-exited IPOs. Therefore, it seems Venture Capitalists exits in larger IPOs with the help of more prestigious underwriters, at the main stock exchanges. In table 8, we compare initial underpricing of Venture Capital-exited and non-Venture Capital-exited IPOs, by presenting parametric tests for SAMPLE II.

Table 8 - Comparison of Underpricing of Different Time Periods

Y, is a dummy that takes the value 1 when a Venture Capitalist(s) sells shares in the IPO, 0 otherwise. Initial underpricing is also known as return on investment, see equation 1. ***Open*** is the percentage difference from the offer price to the first day of trading open price. ***Close*** is the percentage difference from the offer price to the first day of trading closing price. ***Week***, ***Two Week*** and ***Month*** is the percentage difference between the offer price and the closing price of the time periods. **Asterisks indicate the thresholds of statistical significance (* = 10%, ** = 5% and *** = 1%).**

Variables	**Y = 1 VCEX[1]**			**Y = 0 NVCEX**			**TOT**			**Equality of Means** T-Student		**Equality of Medians** Mann-Whitney-Wilcoxon	
	Number	**Average**	**Median**	**Number**	**Average**	**Median**	**Number**	**Average**	**Median**	**t**	**Sig**	**Z**	**Sig**
Initial Underpricing													
Open	12	15,74%	7,56%	38	1,35%	1,78%	50	4,80%	3,92%	- 2,34	0,3**	- 2.20	0,03**
Close[2]	**12**	**10,19%**	**8,00%**	**38**	**- 2,69%**	**- 0,40%**	**50**	**0,40%**	**1,10%**	**- 2,48**	**0,02****	**- 1,84**	**0,07***
Week	12	7,66%	7,24%	38	- 3,80%	- 2,10%	50	- 1,05%	- 0,76%	- 2,02	0,05*	- 1,66	0,10*
Two Week	12	6,84%	5,37%	38	- 1,61%	- 5,59%	50	0,42%	1,64%	- 1,33	0,19	- 1,45	0,15
Month	12	8,12%	5,44%	38	- 5,61%	- 2,09%	50	- 2,32%	- 0,73%	- 2,11	0,04**	- 1,59	0,12

[1] More details of Venture Capital-exited IPOs are presented in table 14 in Appendix.
[2] Underpricing calculated according to the definition by Ritter & Loughran (2004), also called *first-day return*.

Average underpricing of *Close* is positive for Venture Capital-exited IPOs and negative for non-Venture Capital-exited IPOs. The difference is significant at the 5 percent level. Average and median underpricing of *Week*, *Two Week,* and *Month* all have a positive initial return for Venture Capital-exited IPOs and a negative return for non-Venture Capital-exited IPOs. However, the difference is only significant for average *Month*, at the 5 percent level, and for average and median *Week* at the 10% level.

6.2. Results of Regressions On SAMPLE I

Table 9 presents the results of our regression models, using Ritter & Loughran's (2004) definition of underpricing. The regressions control for the characteristic of the issuer, the characteristic of the offer, and market conditions. The variables, *Revenue*, *Age*, *Technology*, *% Created Stocks, Market Return,* and *Market Volatility* were excluded due to not being significant. Compared with Cherrak (2012), similar results were received for the variables *Market Volatility* and *Market* Return, with *Market Volatility* being slightly negative and *Market Return* being positive. However, Cherrak (2012) reported significance of the variable *Market Return*. Furthermore, the variable *Hot & Cold* were excluded due to not being significant. Earlier findings, for example, by Ibbotson & Jaffe (1975) and Ritter & Welch (2002), suggests a higher underpricing in '*hot*' markets, which we cannot conclude based on our regressions.

Table 9 - Regression Models for SAMPLE I

Venture Capital ownership before, percentage Venture Capital ownership before the IPO. ***Venture Capital ownership after***, percentage Venture Capital ownership after the IPO. ***Market cap***, market capitalization (in million euros) of the company on the day of IPO. ***Venture Capital*** equals 1 when a company is backed by Venture Capitalist(s), 0 otherwise. ***Venture Capital-Exit equals*** 1 if the Venture Capitalist(s) sold shares in the IPO. ***Prestige*** equals 1 if the lead underwriter in the IPO was prestigious. ***MTF***, equals 1 if the company was listed on an MTF.
Asterisks indicate the thresholds of statistical significance (* = 10%, ** = 5% and * = 1%).**

Venture Capital Ownership			
	(1) **Dummy**	**(2)** **% VC Before**	**(3)** **% VC After**
Venture Capital	-0.125***		
	(0.001)		
Venture Capital ownership before		-0.127*	
		(0.053)	
Venture Capital ownership after			-0.197*
			(0.052)
Venture Capital-Exit	0.151**		
	(0.015)		
Prestige	-0.0924**		
	(0.029)		
MTF	0.109**	0.131***	0.132***
	(0.012)	(0.001)	(0.001)
Market cap	0.0576***	0.0475***	0.0475***
	(0.000)	(0.000)	(0.000)
Constant	-0.948***	-0.819***	-0.819***
	(0.000)	(0.000)	(0.000)
Observations	504	504	504
R-squared	0.05	0.04	0.04
Adjusted R-squared	0.05	0.03	0.03
F	6.528	7.942	7.970
P	0.000***	0.000***	0.000***
vcetype	Robust	Robust	Robust

The first model (1) regresses the presence of Venture Capitalists in the shareholding structure of companies going public. Venture Capital ownership has a negative effect on underpricing, at a significance level of 1 percent, i.e., Venture Capital-backed IPOs are less underpriced than non-Venture Capital-backed IPOs. The finding is the opposite of our hypothesis. Therefore, we cannot reject the null hypothesis, $H_{0,1}$: *Venture Capital-backed IPOs are not underpriced to a higher degree than non-Venture Capital-backed IPOs*. The second model (2) regresses the percentage ownership held by the Venture Capitalists before the IPO. A negative relationship is observed between the percentage of capital held by Venture Capitalists before the IPO and underpricing, at a 10 percent significance level. This means the more capital held by Venture Capitalists, the less underpriced the IPO will be. Average capital ownership by Venture Capitalists held before the IPO is 29,47%, which is similar to the findings of Cherrak (2012) in the French market (32,46%), but lower than findings in the U.S. (47,7%) by Kaplan & Strömberg (2003). The third model (3) regresses the percentage of ownership held by the Venture Capitalists after the IPO. The regression shows a negative relationship of capital held by Venture Capitalists after the IPO and underpricing, at a 10 percent significant level. In other words, the more capital held by the Venture Capitalists after the IPO, the less underpriced the IPO will be.

Earlier research concluded that there is systematic underpricing of IPOs. This is seen in papers dating back to the 1960s (Ibbotson, 1975), and in a global context (Ritter & Rydqvist, 1994). Less research about underpricing has been done in the Nordics, but empirical results speak for the fact that Nordic IPO markets are less underpriced (Abrahamson, et al., 2011). Our result is consistent with previous findings, i.e., there is systematic underpricing in Nordic markets. In the U.S. it has been shown that Venture Capital-backed companies are more underpriced than non-Venture Capital-backed companies (Bradley, et al., 2015), which our study cannot conclude.

The fact that Venture Capital-backed IPOs are less underpriced supports the certification theory where Venture Capital companies, as a third-party, lowers the information asymmetry between new and old investors by affirming the actual value of an issuer. The finding is in line with the result presented by Neus & Walz (2002) and Megginson & Weiss (1991). The result also supports the signaling theory, where companies acquire self-inflicted costs to signal their value to outside investors. This is shown by the negative effect of *Prestige* and the positive effect of *MTF* on underpricing. The issuer signals their higher value by taking on more costs associated with a more prestigious underwriter and by going public at a stock exchange, which lowers the information asymmetry, and is rewarded by being less underpriced.

Other factors than the participation of Venture Capitalists in the IPO might explain the difference in underpricing. Megginson & Weiss (1991) found lower underpricing of Venture Capital-backed IPOs before controlling for other variables. It is valid to assume a difference in underpricing of Venture Capital-backed IPOs between geographical regions when looking at previous research. Our results support this analysis since the results are similar to the results in France provided by (Cherrak, 2012) and underpricing in Sweden reported by Abrahamson, et al. (2011), but differs from the result presented by Ritter & Welch (2002) in the American market.

'Hot & cold' IPO markets have been used extensively to explain underpricing for Venture Capital-backed IPOs (Ibbotson, et al., 1994). However, our variable *Hot & Cold* did not show a significant effect on underpricing, an alternative explanation for that might be the macroeconomic environment for the sample period. The first half of the 21st century was intentionally excluded from the data set to leave out the dot-com bubble and the financial crisis. This left us with a sample of IPOs conducted within one of the longest periods without economic unravel in modern history (CBPP, 2020). Therefore all IPOs in our data sample can be considered to be *'hot'*. Since earlier research has reported an effect on underpricing in '*hot*' and '*cold*' periods (Ibbotson & Jaffe, 1975) and (Ritter & Welch, 2002), our study might be an outlier in Venture Capital underpricing research.

6.3. Results of Regressions On SAMPLE II

Table 10 present the results of our regression models for Venture Capital-exited IPOs, using Ritter & Loughran's (2004) definition of underpricing. SAMPLE II is a subsample of SAMPLE I, and variables without significance in the regressions of SAMPLE I were removed, except *Market Volatility* and *Age*, since the variables was significant in the regression models of SAMPLE II. The variables *Comp. Stage* and *#VC Investors* from Conradson & Eskilsson (2016) were removed due to not being significant.

Table 10 - Regression Models for SAMPLE II

Venture Capital-Exit equals 1 when a Venture Capitalist(s) sells shares in the IPO. ***Venture Capital-Exit Size***, percentage shares sold by Venture Capitalist(s) in the IPO. ***Age***, age of the company at the date of IPO. ***Market cap***, market capitalization (in million euros) of the company on the day of IPO. ***VC Experience***, age of the oldest Venture Capital investor at IPO. ***IPO Market***, the number of IPOs done in the Nordics the same year as the IPO. ***Market Volatility***, the market volatility 30 days prior to the IPO. ***Lock-Up***, equals 1 if the Venture Capitalist(s) has a lock-up period in the IPO. ***Domestic Investor*** equals 1 if there are any domestic Venture Capitalists as shareholders. ***Foreign Investor*** equals 1 if there are any foreign Venture Capitalists as shareholders. ***Prestige*** equals 1 if the lead underwriter in the IPO was prestigious. ***MTF***, equals 1 if the company was listed on an MTF.
Asterisks indicate the thresholds of statistical significance (* = 10%, ** = 5% and * = 1%).**

Venture Capital Ownership		
	(1) **Dummy**	**(2)** **% Sold**
Venture Capital-Exit	0.139**	
	(0.012)	
Venture Capital-Exit Size		0.174*
		(0.050)
Age	-0.0110***	-0.0106***
	(0.000)	(0.000)
Market cap	0.0665***	0.0650***
	(0.003)	(0.003)
VC Experience	0.0061***	0.0054**
	(0.009)	(0.022)
Market Volatility	- 1.234**	- 1.211**
	(0.031)	(0.032)
IPO Market	- 0.0027***	-0.00240***
	(0.002)	(0.002)
Domestic Investors	0.128**	0.128*
	(0.036)	(0.058)
Foreign Investors	- 0.161**	-0.154**
	(0.015)	(0.028)
Lock-Up	0.354***	0.356***
	(0.000)	(0.000)
Prestige	-0.317***	-0.342***
	(0.000)	(0.000)
MTF	-0.253***	-0.306***
	(0.000)	(0.000)
Constant	-0.874**	-0.788*
	(0.043)	(0.063)
Observations	50	50
R-squared	0.61	0.59
Adjusted R-squared	0.49	0.48
F	14.06	9.414
P	0.000***	0.000***
vcetype	Robust	Robust

In the first model (1), *Venture Capital-Exit* has a positive effect on underpricing, significance at the 5 percent level, i.e., Venture Capital-exited IPOs are more underpriced than non-Venture Capital-exited IPOs. The finding strengthened our hypothesis, and therefore, we can reject the null hypothesis $H_{0,2}$*: Venture Capital-exited IPOs are less underpriced than Venture Capital-backed IPOs where no Venture Capitalist exited*. The effect of the issuer's *Age* on underpricing is similar to Gompers' (1996)[6] findings, who found a negative effect of age on underpricing. The same can be said for *Prestige* and *IPO Market*, where Gompers (1996) reported a slightly negative effect on underpricing for both variables. Although comparing our variable *VC Experience* and *Volatility*, the result differs. Gompers (1996) reported a positive effect of *Volatility* on underpricing, as well as a negative effect of *VC Experience* on underpricing. The second model (2) regresses the total percentage of ownership sold in the IPO by the Venture Capitalists. The model shows that *Venture Capital-Exit Size* has a positive effect on underpricing, which is larger than the effect in the first model. In other words, the higher percentage of shares sold by the Venture Capitalists, the higher the underpricing. The model is significant at the 10 percent level, but it is not far from the 5 percent threshold since the P-value is 0.0502.

The results support the signaling theory, which states that financial intermediaries, like Venture Capitalists, are gatekeepers of good and bad information (Leland & Pyle, 1977). Venture Capitalists signal to outside investors if an issuer is worthwhile by the actions they take in the IPO. This is further shown by the second model (2), where the larger percentage divested by the Venture Capitalist in the IPO, the more underpriced will the IPO be. The signaling effect of Venture Capitalists is consistent with the hypothesis developed by Franzke (2003) that Venture Capital-exited IPOs lead to higher ex-ante uncertainty and, therefore, higher underpricing.

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6 The study was conducted in the U.S. between 1978 and 1987, and some variables, including *VC Experience*, *IPO Market*, *Volatility,* were calculated using different methods.

The argument that signaling theory is applicable on the results from our models, used on SAMPLE II, would be strengthened if the variables *Prestige* and *MTF* had the same result as on the regressions of SAMPLE I, i.e., IPOs with prestigious underwriters are less underpriced, and companies listed on MTFs are more underpriced. In the regression of SAMPLE II, both *Prestige* and *MTF* have a negative effect on underpricing, i.e., IPOs with prestigious underwriters are less underpriced, but IPOs conducted on stock exchanges are more underpriced. An explanation for the difference is that 11 of 12 exits took place at stock exchanges, hence the stronger signaling effect of the *Venture Capital-Exit* affects the result of the *MTF* variable.

There can be several reasons why Venture Capitalists exits in the IPO. Neus & Walz (2002) argued that Venture Capitalists face a trade-off between selling in the IPO at a discount or wait until the actual value of their investment is revealed. This is shown empirically by higher underpricing of Venture Capital-exited IPOs and might explain why only 12 of 50 Venture Capital-backed IPOs were exited. Rossetto (2006) argued that the exit strategy of Venture Capitalist depends on their opportunity cost, and the cost of underpricing in the IPO might be lower than the opportunity cost of new investments. Cumming, et al. (2005) concluded that Venture Capital investors had been accused of not providing enough liquidity in IPOs. That only 1 of 12 Venture Capitalists did a full exit in the IPO might be empirical evidence that Venture Capital investors are aware of the cost and are hesitant to exit in the IPO, but needed the capital for new opportunities since they only liquidate part of their holdings.

Gompers (1996) argued that younger Venture Capital companies will be more underpriced due to their incentives to build up a positive reputation, which is done most efficiently by successfully exiting their holdings in IPOs. As shown in table 7, Venture Capitalists that exit in the IPO is younger than Venture Capitalists that does not exit in the IPO. However, when controlling for the grandstanding effect in our regression models, the effect of *VC Experience* is slightly positive. In other words, the older the Venture Capitalist is, the more underpriced the IPO will be. This is contradictory to the result presented by Gompers (1996).

6.4. Robustness & Validity of Result

Robustness tests are used to test assumptions of the model being used (Huntington-Klein, u.d.). Skewness-Kurtosis and Shapiro-Wilk test was used to test for normality (D'Agostino , et al., 1990). The test showed that the data set was not normally distributed, and adjustments were made. Analysis of the presence of multicollinearity was conducted using a correlation matrix, i.e., to test whether the variables were highly correlated with each other (Mansfield & Helms, 1982). A high correlation was found between several variables, they were therefore removed. Breusch-Pagan/Cook-Weisberg-test was used to test for heteroscedasticity (Williams, 2020), which was found, and therefore Huber/White's robust standard error was used in the models. The presented test was first applied to our initial models presented in tables 12 and 13 in the Appendix.

By suggestion from White & Lua (2014), less traditional tests of the robustness of our results were completed. The top and bottom 10 percent of the dependent variables were manually analysed to control for extreme values, and adjustments were made. The adjustment increased the significance of the result and slightly altered the effect of our explanatory variables. Based on White & Lua (2014), we applied our models to different time frames of the dependent variable, which did not alter the result, except underpricing calculated to closing price a month after the first trading day. Finally, we applied our models to the four-time periods: 2009-2012, 2013-2014, 2015-2017, and 2018-2019. The test resulted in multivariance in several regressions, likely due to the dummy variable trap since we have a limited number of Venture Capital-backed observations in our data set (Dougherty, 2011).

7. Concluding Remarks

In this final part of the thesis information, and knowledge gained in the preceding chapters will be concluded. Previous parts of the thesis constitute a comprehensive understanding of the effect of Venture Capital investments on underpricing in IPOs. The chapter brings forward the thesis's most important conclusions derived from the results and ends with a suggestion for future research.

7.1. Conclusion

The purpose of our study was to provide further knowledge on underpricing of Venture Capital-backed IPOs in the Nordics, by implementing a model put forward by Cherrak (2012) and extend the study by implementing specific Nordic variables related to Venture Capital-exits, put forward by Conradson & Eskilsson (2016). The study analysed 504 IPOs in the Nordic regions between 2009 and 2019, where the dot-com bubble and the financial crisis were intentionally excluded. This might make our study an outlier in Venture Capital underpricing research since no *'cold'* periods were included in the data set. Venture Capital investors backed 50 of the 504 IPOs, and in 12 out of the 50 Venture Capital-backed IPOs, at least one Venture Capitalist exited.

Our result is consistent with previous research since systematic underpricing of IPOs is found in the Nordic regions. We conclude that Venture Capital-backed IPOs are less underpriced than non-Venture Capital-backed IPOs. More capital held by the Venture Capitalists after the IPO will also lead to IPOs being less underpriced. The result supports the asymmetric information theory where Venture Capitalists, as a third party, act as certifiers and where issuers signal their actual value to outside investors by acquiring self-inflicted costs by using more reputational underwriters and by going public at stock exchanges.

Analysing the subgroup of Venture Capital-backed IPOs, we conclude that IPOs where the Venture Capitalist exits are more underpriced, and the more shares they sell, the more underpriced the IPO will be. Hence, the behaviour of Venture Capitalists in the IPO affects the level of underpricing. The results support the fact that old investors and issuers alike, signal to the market in an IPO. Venture Capital investors have been accused of not providing enough liquidity in IPOs. Our results show that the exit strategy of Venture Capitalist depends on their opportunity cost and that Venture Capitalists are aware of the cost of underpricing, and therefore are hesitant to exit in the IPO.

To conclude, our result is empirical evidence that underpricing in the Nordic region is affected by information asymmetry. Venture Capital investors will lower the information asymmetry by certifying IPOs and therefore lowering the cost of going public. However, how they act in the IPO will signal to the market, and by exiting in the IPO, they increase the information asymmetry and thereby increasing the level of underpricing in the IPO.

7.2. Suggestion for Future Research

As mentioned, our study finds that Venture Capitalists have a significant effect on underpricing of IPOs in the Nordics. Hence, we suggest extending the research provided in this paper on Venture Capital-exits and apply it to a global context. Further research could expand on why Venture Capitalists are penalized for exiting in the IPO, since this paper has shown that Venture Capital-exited IPOs are more underpriced and that the Venture Capitalists *'leave money on the table'* by divesting their holdings in the IPO. However, our scope was narrowed to the Nordics, and a broader global context could provide a different and/or a more comprehensive result.

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Appendix

Additional Data

Table 11 - Underpricing by Factor Variables

N corresponds to the total amount of observation in the group, **A** corresponds to the average value, **M** corresponds to the median value, **VC Backed** is a sample of only Venture Capital-backed companies, **Non-VC Backed** is a sample of companies not backed by Venture Capitalist

	SAMPLE I									**SAMPLE II**								
Variables	**VC Backed**			**Non-VC Backed**			**TOT**			**VC Exit**			**Non-VC Exit**			**TOT**		
	N	**A**	**M**	**N**	**A**	**M**	**N**	**A**	**M**	**N**	**A**	**M**	**N**	**A**	**M**	**N**	**A**	**M**
Country																		
Sweden	42	- 1%	1%	297	12%	3%	**339**	**11%**	**3%**	9	13%	11%	33	- 5%	- 1%	**42**	**- 1%**	**1%**
Norway	2	9%	9%	81	6%	0%	**83**	**6%**	**0%**	1	9%	9%	1	8%	8%	**2**	**9%**	**9%**
Denmark	3	6%	1%	23	8%	2%	**26**	**7%**	**17%**	1	- 3%	- 3%	2	11%	11%	**3**	**6%**	**- 1%**
Finland	3	7%	1%	45	5%	4%	**48**	**5%**	**4%**	1	0%	0%	2	10%	10%	**3**	**7%**	**1%**
Iceland	0	--	--	8	3%	0%	**8**	**3%**	**0%**	0	--	--	0	--	--	**0**	**--**	**--**
Stock Exchange																		
OMX Stockholm	11	12%	11%	80	11%	9%	**91**	**11%**	**10%**	8	15%	13%	3	5%	3%	**11**	**12%**	**11%**
OMX Copenhagen	3	6%	-1%	15	7%	3%	**18**	**7%**	**2%**	1	-3%	-3%	2	11%	11%	**3**	**6%**	**-1%**
OMX Helsinki	1	0%	0%	23	6%	4%	**24**	**5%**	**4%**	1	0%	0%	0	--	--	**1**	**0%**	**0%**
OMX Iceland	0	--	--	8	3%	0%	**8**	**3%**	**0%**	0	--	--	0	--	--	**0**	**--**	**--**
Oslo Bors	2	9%	9%	80	6%	4%	**82**	**6%**	**0%**	1	10%	10%	1	8%	8%	**2**	**9%**	**9%**
MTF																		
NGM	0	--	--	21	-5%	-10%	**21**	**- 5%**	**-10%**	0	--	--	0	--	--	**0**	**--**	**--**
First North	24	-2%	0%	146	12%	2%	**170**	**10%**	**2%**	1	-6%	-6%	23	-2%	0%	**24**	**-2%**	**-4%**
Spotlight	9	-11%	-12%	81	15%	0%	**90**	**13%**	**0%**	0	--	--	9	-10%	-12%	**9**	**-10%**	**-12%**

	SAMPLE I									SAMPLE II								
Variables	**VC Backed**			**Non-VC Backed**			**TOT**			**VC Exit**			**Non-VC Exit**			**TOT**		
	N	**A**	**M**	**N**	**A**	**M**	**N**	**A**	**M**	**N**	**A**	**M**	**N**	**A**	**M**	**N**	**A**	**M**
Year																		
2009	0	-	-	4	18%	13%	**4**	**18%**	**13%**	0	-	-	0	-	-	**0**	**-**	**-**
2010	1	23%	23%	33	3%	0%	**34**	**3%**	**0%**	0	-	-	1	23%	23%	**1**	**23%**	**23%**
2011	1	3%	3%	21	23%	2%	**22**	**22%**	**2%**	1	3%	3%	0	-	-	**1**	**3%**	**3%**
2012	0	-	-	12	-5%	-1%	**12**	**-5%**	**-1%**	0	-	-	0	-	-	**0**	**-**	**-**
2013	0	-	-	20	11%	3%	**20**	**11%**	**3%**	0	-	-	0	-	-	**0**	**-**	**-**
2014	1	11%	11%	36	9%	4%	**37**	**9%**	**4%**	0	-	-	1	1%	1%	**1**	**11%**	**11%**
2015	4	15%	15%	57	12%	5%	**61**	**12%**	**5%**	0	-	-	4	15%	15%	**4**	**15%**	**15%**
2016	10	-4%	0%	81	13%	2%	**91**	**11%**	**1%**	4	8%	8%	6	-12%	-7%	**10**	**-4%**	**0%**
2017	25	-1%	0%	93	8%	3%	**118**	**6%**	**3%**	6	14%	11%	19	-5%	-1%	**25**	**-1%**	**0%**
2018	8	-1%	-1%	59	8%	0%	**67**	**7%**	**0%**	1	6%	6%	7	-2%	-2%	**8**	**-1%**	**-1%**
2019	0	-	-	38	10%	3%	**38**	**10%**	**3%**	0	-	-	0	-	-	**0**	**-**	**-**

Table 12 - Initial Models for SAMPLE I

Venture Capital equals 1 when a company is backed by Venture Capitalist(s). ***Venture Capital ownership before***, percentage Venture Capital ownership before the IPO. ***Venture Capital ownership after***, percentage Venture Capital ownership after the IPO. ***Venture Capital-Exit*** equals 1 if the Venture Capitalist(s) sold shares in the IPO. ***Age***, age of the company at the date of IPO. ***Revenue***, revenue before the IPO date (in million euros). ***Market cap***, market capitalization (in million euros) of the company on the day of IPO. ***% Created Stocks***, the ratio of the number newly issued stocks in terms of the number of shared subjected to IPO. ***Market Return***, the MSCI market return 90 days prior to the IPO. ***Market Volatility***, the market volatility thirty days prior to the IPO. ***Technology*** equals 1 if the company belongs to the technological sector. ***Hot & Cold***, equals 1 if the IPO was in a '*hot*' period. ***Prestige*** equals 1 if the lead underwriter in the IPO was prestigious. ***MTF***, equals 1 if the company was listed on an MTF. **Asterisks indicate the thresholds of statistical significance (* = 10%, ** = 5% and *** = 1%).**

Venture Capital Ownership

	(1) Dummy	(2) Dummy	(3) % VC Before	(4) % VC Before	(5) % VC After	(6) % VC After
Venture Capital	-0.143***	0.144***				
	(0.001)	(0.001)				
Venture Capital ownership before			-0.165*	-0.134*		
			(0.051)	(0.076)		
Venture Capital ownership after					-0.229*	-0.214*
					(0.064)	(0.063)
Venture Capital-Exit	0.164***	0.165***	0.0790		0.0616	
	(0.010)	(0.008)	(0.209)		(0.281)	
Age	-0.000526	-0.000514	-0.000499	-0.000515	-0.000500	-0.000500
	(0.113)	(0.114)	(0.136)	(0.116)	(0.136)	(0.116)
Revenue	0.0108	-0.0106	-0.00918	-0.00849	-0.00919	-0.00867
	(0.198)	(0.203)	(0.269)	(0.302)	(0.268)	(0.292)
Market cap	0.0653***	0.0655***	0.0647***	0.0644***	0.0648***	0.0644***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Prestige	-0.0876**	-0.0842**	-0.0892**	-0.0838**	-0.0895**	-0.0839**
	(0.042)	(0.044)	(0.040)	(0.046)	(0.039)	(0.045)
MTF	0.108**	0.0974**	0.100**	0.0848**	0.100**	0.0853**
	(0.012)	(0.026)	(0.019)	(0.048)	(0.019)	(0.047)
Market Return	0.300	0.326	0.290	0.302	0.293	0.307
	(0.272)	(0.203)	(0.289)	(0.238)	(0.284)	(0.232)
Technology	0.00595		0.00513		0.00497	
	(0.886)		(0.903)		(0.906)	
% Created Stocks	0.104		0.103		0.101	
	(0.277)		(0.282)		(0.290)	
Market Volatility	-0.0448		-0.00692		-0.00254	
	(0.842)		(0.976)		(0.991)	
Hot & Cold	-0.00968		-0.0166		-0.0167	
	(0.750)		(0.583)		(0.580)	
Constant	-1.087***	-1.063***	-1.082***	-1.046***	-1.084***	-1.047***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	504	504	504	504	504	504
R-squared	0.07	0.07	0.06	0.05	0.06	0.05
Adjusted R-squared	0.05	0.05	0.04	0.04	0.04	0.04
F	3.197	4.609	2.654	4.170	2.628	4.212
P	0.000***	0.000***	0.00**	0.000***	0.00**	0.000***
vcetype	Robust	Robust	Robust	Robust	Robust	Robust

Table 13 - Initial Models for SAMPLE II

Venture Capital-Exit equals 1 when a Venture Capitalist(s) sells shares in the IPO ***Venture Capital-Exit Size***, percentage shares sold by Venture Capitalist(s) in the IPO. ***Age***, age of the company at the date of IPO. ***Market cap***, market capitalization (in million euros) of the company on the day of IPO. ***Comp. Stage***, age of company at first Venture Capital investment. ***VC Experience***, age of the oldest Venture Capital investor at IPO. ***#VC Investors***, number of Venture Capitalists that have ownership in the company. ***IPO Market*** is the number of IPOs done in the Nordics the same year as the IPO. ***Market Return***, the MSCI market return 90 days prior to the IPO. ***Market Volatility***, the market volatility 30 days prior to the IPO. ***Lock-Up***, equals 1 if the Venture Capitalist(s) has a lock-up period in the IPO. ***Domestic Investor*** equals 1 if there are any domestic Venture Capitalists as shareholders. ***Foreign Investor*** equals 1 if there are any foreign Venture Capitalists as shareholders. ***Technology*** equals 1 if the company belongs to the technological sector. ***Hot & Cold***, equals 1 if the IPO was in a '*hot*' period. ***Prestige*** equals 1 if the lead underwriter in the IPO was prestigious. ***MTF***, equals 1 if the company was listed on an MTF.
Asterisks indicate the thresholds of statistical significance (* = 10%, ** = 5% and * = 1%).**

	(1) **Dummy**	**(2)** **% Sold**
Venture Capital-Exit	0.0926	
	(0.264)	
Venture Capital-Exit Size		0.0808
		(0.518)
Age	-0.0121*	-0.0119
	(0.084)	(0.103)
Market cap	0.0688***	0.0685***
	(0.007)	(0.009)
VC Experience	0.00730**	0.00691**
	(0.012)	(0.023)
Market Volatility	-1.735**	-1.817**
	(0.044)	(0.031)
IPO Market	-0.00352***	-0.00347***
	(0.006)	(0.008)
Lock-up	0.371***	0.378***
	(0.000)	(0.000)
Domestic investor	0.154**	0.152*
	(0.050)	(0.071)
Foreign Investor	-0.147*	-0.140
	(0.077)	(0.101)
MTF	-0.287***	-0.332***
	(0.003)	(0.000)
Prestige	-0.325***	-0.341***
	(0.000)	(0.000)
Comp. Stage	0.000989	0.00101
	(0.887)	(0.889)
#VC Investors	-0.0261	-0.0299
	(0.490)	(0.438)
Market Return	-0.521	-0.715
	(0.415)	(0.213)
Technology	0.0496	0.0473
	(0.504)	(0.546)
Hot & Cold	0.0786	0.0648
	(0.372)	(0.447)
Constant	-0.833*	-0.757*
	(0.068)	(0.094)
Observations	50	50
R-squared	0.64	0.63
Adjusted R-squared	0.46	0.45
F	8.113	8.919
P	0.000***	0.000***
vcetype	Robust	Robust

Table 14 - Underwriters with More Than 5% Market Share

The table displays underwriters ranked on market share in the Nordics.

Name of Underwriter	**Aggregated Data**				
	Rank	Market Share	Credit	Deal Count	Value of IPOs
Carnegie	1	14,48%	€11,27 Billion	161	€135,47 Million
SEB	2	12,36%	€9,62 Billion	118	€67,82 Million
Morgan Stanley	3	10,74%	€8,36 Billion	38	€125,52 Million
UBS	4	7,60%	€5,92 Billion	24	€65,15 Million
Nordea	5	6,99%	€5,44 Billion	71	€122,46 Million
ABG Sundal Collier	6	6,04%	€4,70 Billion	99	€188,69 Million
Goldman Sachs	7	6,02%	€4,68 Billion	25	-

Table 15 - Venture Capital-Exited IPOs

List with where Venture Capitalist exited in the IPO. ***% of VC Exit*** is the percentage of Venture Capitalist(s) sold shares, calculated as: sold share in the IPO/Shares before IPO, ***Age at IPO***, is the company age at the IPO date, ***Company stage*** is a classification of the issuer based on the company age at the time of the first Venture Capital investment (Seed = 0-1 years, Start-Up = 2-4 years, Early Growth = 5-7 years, Later-Stage = 8-10 years and Mature > 10 years). ***VC Experience*** is a classification of the age of the oldest Venture Capitalist at IPO date (Novice = 0-6 years, Intermediate = 7-13 years, Experienced = 14-20 years and Senior > 20 years).

Issuer Name	**Underpricing**	**% of VC Exit**	**Age at IPO**	**Company Stage**	**VC Experience**	**Market Capitalization**
Alligator Bioscience AB	17%	29%	15	Later-Stage	Intermediate	€230,59 M
Boozt AB	25%	57%	10	Later-Stage	Senior	€440,95 M
Edgeware AB	2%	45%	12	StartUp	Experienced	€41,94 M
Infront ASA	10%	66%	19	Early Growth	Experienced	€69,91 M
LeoVegas AB	15%	63%	6	StartUp	Experienced	€372,08 M
Lime Technologies AB	6%	57%	28	Mature	Novice	€91,54 M
MAG Interactive AB	- 6%	65%	7	StartUp	Intermediate	€80,59 M
MIPS AB	11%	53%	16	Later-Stage	Senior	€119,21 M
Nets A/S	- 3%	43%	48	Mature	Intermediate	€1239,46 M
Rovio Entertainment Oyj	0%	100%	14	Later-Stage	Intermediate	€896,10 M
Transmode AB	3%	26%	11	StartUp	Experienced	€164,51 M
XSpray Pharma AB	42%	31%	14	Mature	Novice	€39,19 M

Nordic Stock Exchanges

There are three stock exchange-companies in the Nordics. Nasdaq is the dominant player after consolidating the region, with stock exchanges in Stockholm (Sweden), Copenhagen (Denmark), Helsinki (Finland), and Reykjavik (Iceland). Member rules (regulations) are joint between Nordic exchanges (Nasdaq, 2020). The second largest player is the Nordic Growth Market (NGM), a subsidiary of Börse Stuttgart. Their main exchange, NGM Equity, is active in Sweden, Finland, Denmark, and Norway. The main Norwegian stock exchange, Oslo Børs, is a stand-alone stock exchange focusing on fishing, energy, and shipping. The exchange is more niched in their offering and, therefore, different in characteristics compared to the other Nordic markets. Apart from stock exchanges, the Nordics has MTFs, Multilateral Trading Facilities, MTFs are EU regulated trading platforms that are not traditional stock exchanges (Capital, 2020). Nasdaq operates the largest one, First North Growth Market, which is active in the same markets as Nasdaq Nordics. The second largest one is the Spotlight Stock Market (previously Aktietorget) owned by Sedermera Fondkommission. Spotlight Stock Market has been active in the Swedish market since the ’90s and from 2018 also operating in Denmark.

MSCI Index

The MSCI Nordic Country Index captures large and mid-cap representation across the countries: Sweden, Norway, Denmark, and Finland. With 71 constituents, the MSCI index covers almost 85% of the free-floated market capitalization in each of the four countries. The index is based on the MSCI Global Investable Indexes Methodology, which is an exhaustive and persistent approach to index structure, enabling a global view and cross-regional comparisons across all market capitalization size, sector, and segments. The methodology enables an exhaustive coverage of the relevant investment opportunity set with a strong emphasis on index liquidity and replicability. The index is analysed quarterly to follow the change in the underlying equity markets while reducing disproportionate index turnover. The index is measured in dollar, however, in our calculations, including the index, we only measure the delta change of the index in percent (MSCI, 2020).

CUMULATIVE INDEX PERFORMANCE — NET RETURNS (USD)
(MAY 2005 – MAY 2020)

ANNUAL PERFORMANCE (%)

Year	MSCI Nordic Countries	MSCI World	MSCI ACWI
2019	19.95	27.67	26.60
2018	-12.07	-8.71	-9.41
2017	25.60	22.40	23.97
2016	-4.13	7.51	7.86
2015	2.00	-0.87	-2.36
2014	-5.72	4.94	4.16
2013	25.13	26.68	22.80
2012	22.08	15.83	16.13
2011	-17.90	-5.54	-7.35
2010	25.06	11.76	12.67
2009	47.07	29.99	34.63
2008	-53.52	-40.71	-42.19
2007	21.24	9.04	11.66
2006	39.26	20.07	20.95

Source: (MSCI, 2020)