



Vaasan yliopisto
UNIVERSITY OF VAASA

Joanna Kyrölä

Does private equity ownership create long-term value for companies?

Empirical evidence from the Nordic IPOs during 2001-2018

School of Accounting and Finance
Master's thesis in Finance
Master's Degree Programme in Finance

Vaasa 2021

UNIVERSITY OF VAASA**School of Accounting and Finance**

Author:	Joanna Kyrölä		
Title:	Does private equity ownership create long-term value for companies? Empirical evidence from the Nordic IPOs during 2001-2018		
Degree:	Master of Science in Economics and Business administration		
Master's Programme:	Master's Degree Programme in Finance		
Supervisor:	Vähämaa Sami		
Year of completing the Thesis:	2021	Pages:	70

Abstract:

The purpose of this study is to examine how private equity ("PE") ownership influences underpricing and long-term performance of initial public offerings ("IPOs") in the Nordic countries. More specifically, this study compares IPOs with different private equity ownerships and tries to find differences in the first-day returns and aftermarket performances. PE refers to funds invested in a private company by a PE investor in exchange for a stake of ownership in the company. PE investors create value to the target company e.g., by financing and developing the operations and providing extensive network in different aspects of the business. PE can be divided into three subcategories by the maturity and lifecycle of the target company. These are venture capital, growth equity, and buyout. When the target company has grown, PE investors divest their investments through exits. An initial public offering is an example of an exit strategy, in which the target company's shares are listed on a stock exchange for the first time.

The final data sample consists of 279 IPOs issued in the time period of 2001 to 2018. Out of the 279 IPOs, 215 are non-backed, 42 PE-backed, and 22 VC-backed. PE-backed IPOs refer to companies invested by growth equity and buyout funds. The long-run performance is measured with buy-and-hold abnormal returns ("BHARs") and the drivers explaining the long-run performance are studied with four different OLS regressions. The drivers include several offer-, firm-, and ownership-specific variables.

The Nordic PE Market is relatively young and has stayed as a minority in the academic literature. This study aims to contribute previous academic literature by extending the research to Nordic countries and provide insight about IPOs with different financial sponsors, the level of possible underpricing, and long-term performance.

The results show that IPOs in the Nordic countries are underpriced on average and the level of underpricing differs whether the company is backed by a PE owner or not. The level of underpricing is even higher during hot issue markets. The long-run performance is also affected by the different PE owners. Previous academic literature suggests that PE-backed IPOs perform better than VC- and non-backed IPOs. In this study, the evidence is not unanimous as the results are in line with the previous academic literature in value-weighted terms but not in equal-weighted terms. Therefore, according to this study, it cannot be concluded whether a company having a PE owner in their operations creates long-term value compared to a company not having a PE owner in their operations.

Key words: Private equity, IPO, underpricing, aftermarket performance, value creation

Contents

1	Introduction	6
1.1	Purpose of the study	8
1.2	Hypotheses	8
1.3	Structure of the study	9
2	Private equity ownership	11
2.1	Private equity	11
2.2	Private equity value creation	13
2.3	Private equity exit strategies	15
2.3.1	Sale to a third party	16
2.3.2	IPO as an exit strategy	17
2.3.3	Other exit strategies	18
3	Initial public offerings	20
3.1	The listing process	20
3.2	IPO valuation	21
3.3	Performance of IPOs	22
3.3.1	Underpricing	23
3.3.2	Hot and cold issue markets	25
3.3.3	Aftermarket performance	26
3.4	Performance of PE- and VC-backed IPOs	29
4	Data and methodology	33
4.1	Data description	33
4.2	Nordic private equity market	38
4.3	Methodology	40
4.3.1	Initial returns	41
4.3.2	Buy-and-hold abnormal returns	42
4.3.3	Private equity ownership	43
4.3.4	Controls	43
4.4	Regression models	44

5	Results	46
5.1	Underpricing	46
5.2	Performance of IPOs	49
5.3	Multivariate regressions of 36-month aftermarket performance	52
6	Conclusions	56
	References	59
	Appendices	66
	Appendix 1. The sample	66

Tables

Table 1. Summary of previous studies on initial and long-run performance of IPOs.	28
Table 2. Summary of previous studies on long-run performance of IPOs with PE ownership.	32
Table 3. Volume distribution across year and country.	34
Table 4. IPOs by ownership type.	35
Table 5. Descriptive statistics for the IPO group	36
Table 6. Relative industry distribution of IPOs.	37
Table 7. Annual levels of underpricing.	38
Table 8. Underpricing in different business cycles.	49
Table 9. Buy-and-hold abnormal returns in the Nordic countries.	50
Table 10. F-test for examining the differences in the long-run performance in a 36-month time period.	52
Table 11. Multivariate regressions of long-run performance in a 36-month holding period.	55

Figures

Figure 1. Annual IPOs, 2000-2020 (StockAnalysis 2021).	7
Figure 2. PE fund and fee structure (Zeisberger et al. 2017)	12
Figure 3. PE deal activity in the Nordic countries (Pitchbook 2021).	39
Figure 4. VC deal activity in the Nordic countries (Pitchbook 2021).	40

1 Introduction

Private equity (“PE”) and its sub-categories venture capital (“VC”), growth capital, and buyout (“BO”) are sources to finance company’s operations to create value. Zeisberger, Prah, and White (2017) describe how PE industry has developed through the credit crunch, financial crises, and bubble periods around the world. It has changed from financial sponsors enhancing company’s operations and capital structure to financial sponsors committing to the company, providing active ownership, and building the company. Research “The state of Nordic private equity 2019” by Argentum shows how PE firms are more interested than ever to consider the sustainability issues in their investments and, thus being able to enhance the overall wellbeing in the world.

PE funds’ success is measured e.g., in its capability to divest the portfolio companies profitably. An initial public offering, where a private company’s shares are issued to the public for the first time, is one example of the PE funds’ exit strategies. The previous academic literature is extensively focused on the phenomenon of underpricing and the aftermarket performance of IPOs. Additionally, the effect of private equity ownership on underpricing and aftermarket performance is emphasized in the literature. The prevalent evidence expects that IPOs backed by PE-backed perform better than VC- or non-backed IPOs as e.g., studies by Brav and Gompers (1997), Levis (2011), Bergström, Nilsson and Wahlberg (2006) show. However, Belghitar and Dixon (2011), and Buchner, Mohamed and Wagner (2019) did not find performance differences between PE- and VC-backed IPOs and is contrary to the prevalent evidence.

The year 2020 was busy in the private equity market around the world. Covid-19 and its consequences pushed companies of all sizes and in different industries into a difficult position to figure out how they will manage in unexpected market conditions with restrictions. Figure 1 shows how the number of initial public offerings (“IPOs”) have developed in the U.S stock market during the 21st century, but also how unusual the year 2020 has been. There have been 480 initial IPOs in 2020 compared to 233 IPOs in 2019.

Additionally, the previous time the IPO markets experienced high listing activity was during the dot-com bubble in 2000.



Figure 1. Annual IPOs, 2000-2020 (StockAnalysis 2021).

Airbnb and Doordash are examples listed in the U.S in 2020. Doordash is operating in a food delivery industry that succeeded in the pandemic conditions whereas Airbnb needed to make significant decisions to survive in the lodging industry. An article about Airbnb and DoorDash's IPOs by Danielle Abril (2020) shows that on the first trading day the Airbnb stock rose about 135% and Doordash stock 80%. High first-day returns are a common phenomenon for IPOs. Investors start hyping and become optimistic about the future outlook of the company, causing the stock prices to jump. Ljungqvist and Wilhelm (2003) identified the same phenomenon of irrational behavior during the dot-com bubble in the early 21st century. The level of underpricing was eight times bigger than the average level of underpricing and the volume of IPOs was above average. Expectations impact the stock price and without focusing on the cash flows and fundamentals of the listing firms, the investment may be an inferior choice in the long run.

In the Nordic countries, Covid-19 decreased the amount and value of PE deals. However, 37,1% of all European PE-backed IPOs were proceeded in the Nordics, which is the second-highest share over the previous ten years. This study focuses on studying the

underpricing and aftermarket performance of PE-and VC-backed IPOs in the Nordic markets by using data from April 2001 to March 2018. Previous studies that have focused on the Nordic countries have not had as extensive dataset and, therefore this study can give more accurate results about the long-term performance of IPOs with different financial sponsors. This study aims to contribute previous studies by providing research in the Nordic countries and being a guideline for future studies. Additionally, this study provides relevant and eye-opening information for companies' management and investors.

1.1 Purpose of the study

The purpose of this study is to examine how IPOs with private equity ownership experience underpricing and how these IPOs perform in the long term in the Nordic countries in time period of 2001 to 2018. In this study, the long-term performance is considered as a 3-year holding period. Additionally, it is compared how different private equity ownerships affect the underpricing and aftermarket performance. To conclude, this study aims to answer the question of whether private equity ownership adds long-term value to the target companies.

1.2 Hypotheses

The first hypothesis is based on the common phenomenon of IPOs, the underpricing. Reilly (1973) and Ibbotson (1975) have been among the first people to document that on the first trading day, issuing firm's stock price has been substantially higher than the initial offer price. Brav and Gompers (1997), Bergström et al. (2006), and Belghitar and Dixon (2011) found that the level of underpricing differs whether the IPO is backed by a financial sponsor or not. By following these observations, the first hypothesis is formed as

H1: PE ownership influences the underpricing of IPOs in the Nordic markets

Ritter (1991), Loughran and Ritter (1995), Espenlaub, Gregory and Tonks (2000) found that IPOs tend to underperform their corresponding benchmark in the long term. However, when private equity ownership is a contributing factor, previous studies show that PE ownership has an effect on the long-run performance. Studies by Bergström et al. (2006) and Levis (2011), show that PE-backed IPOs perform better than VC-and non-backed IPOs in Europe. Therefore, the second hypotheses can be formed as the prevalent evidence indicates

H2: IPOs with PE ownership perform better in the long run than IPOs with VC ownership or without any financial sponsor

1.3 Structure of the study

This study is divided into six main chapters, covering both the theoretical and empirical parts of the topic. In the first chapter, the topic is introduced by briefly presenting the private equity market and how the market relates to initial public offerings. Additionally, the purpose of the study and the research hypotheses are introduced. The second chapter focuses on explaining the concept of private equity and the value creation associated with private equity ownership. Moreover, different private equity exit strategies, such as initial public offering, are provided. In the third chapter, initial public offerings are in more detail in the scope. The listing process, IPO valuation, and the most common anomalies related to IPOs are discussed. Additionally, the previous academic literature regarding the performance of IPOs is presented in general but also the performance of IPOs with different PE owners.

The empirical part begins from the fourth chapter. The data is reviewed, the Nordic PE market is described and, the methodologies and regression models are explained. The fifth chapter presents the results of the study for underpricing, aftermarket

performance and the regression models. The final chapter provides a summary, and conclusions of the study, together with ideas for further research.

2 Private equity ownership

This chapter focuses on determining the concept of private equity so that the empirical part of this study is accessible. It is explained in more detail how private equity is divided into sub-categories and why firms should consider or pursue private equity investments. Additionally, private equity exit strategies are covered.

2.1 Private equity

A general definition for private equity is determined by Zeisberger, Prahel and, White (2017), whereby PE firms invest long-term capital usually to private companies in exchange for a stake of ownership in the company. According to Kaplan and Strömberg (2009), a private equity fund is composed of investors, known as limited partners, who provide capital for future investments and management fees for the general partners. The limited partners can be institutional investors and individual investors. The general partner of the fund, the private equity firm, manages the fund and commits always a certain percentage of capital to the fund.

Zeisberger et al. (2017) determine that limited and general partners aim to create return for the invested capital through the made investments. General partners receive management fees annually from limited partners and usually a 20 percent share of the fund's excess net profits, known as a carried interest. In turn, limited partners earn the rest of the profits. In more detail, usually, the general partners do not receive any of the carried interest before the fund has managed to return all the invested capital and a minimum return, a hurdle rate, for limited partners. When this point is reached, the 80-20 split is in force. Figure 2 presents a basic structure of a PE fund and its fees.

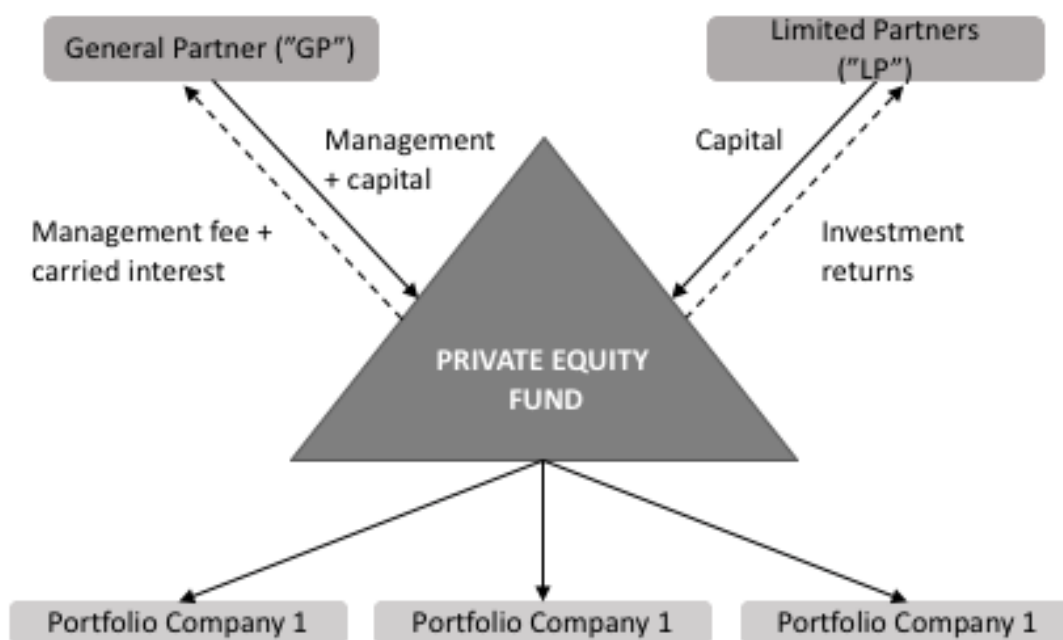


Figure 2. PE fund and fee structure (Zeisberger et al. 2017)

Kaplan and Strömberg (2009) determine that a fund's life cycle is typically from 10 to 13 years which is divided into two time periods. The first period is the investment period when the fund is investing the raised capital to different companies. The second period is divided into holding and divestment periods, which are focused on returning the capital to the investors.

Private equity can be categorized into three different investment types based on a fund's investment thesis and the target company's life cycle. These sub-categories are venture capital, growth capital, and buyout. In this study, PE refers to growth capital and buyout funds together and VC funds are considered as their own.

Michala (2019) defines venture capital as investments into early-stage and fast-growing companies, that are usually based on new technologies or other innovations and where the risks are higher compared to growth equity and buyout funds. According to Zeisberger et al. (2017), VC funds have more companies in their portfolios in order to

diversify the risk and increase the possibility to find a successful investment. Venture capitalists help the startups to develop their innovations with the help of capital, expertise and, networks and get in return a minority equity stake of the company. VC funding can be for seed-stage startups that have only the idea for the business or late-stage startups with an expanding business. In addition, VC funding is usually raised in several stages, allowing the target companies to be assessed and in later funding rounds, the capital is headed to the most promising investments.

Zeisberger et al. (2017) describe growth equity funds as investments into more advanced businesses that have passed the start-up stage and have successful business models. The growth equity investors help the company to move to the next step in the development by building strong relationships between stakeholders and using the shared expertise. Growth equity investors aim for a minority equity stake in the company, similarly as VC investors.

Buyout funds differ more distinctly from the other two categories with their features. Michala (2019) determines that buyout funds invest in more mature companies with over average profit margins, steady cash flows, and different structures of ownership. Kaplan and Strömberg (2009) add that majority of buyout transactions are usually funded with a vast amount of debt, which enables higher returns for the equity stake. These transactions are called leveraged buyouts. According to Zeisberger et al. (2017), buyout investors receive the majority stake of ownership in the company, allowing them to structure e.g., the company's financial, governance, and operational characteristics. Jensen (1989) defines it as the plan of enhancing the firm's operations and creating economic value.

2.2 Private equity value creation

The reason why firms consider PE firms as an investor is the probable value creation for the target company and owners. Value creation is in interest for both the initial owners

and PE financial sponsors. PE firms can be considered as financial sponsors to the target companies because of the financing and help provided. Kaplan and Strömberg (2009) divide the value creation into three categories: financial, governance and operational engineering.

Kaplan and Strömberg (2009) define that financial engineering is often referred to as the leverage brought by PE funds and the equity incentives given for the management teams of the portfolio companies. The benefits related to leverage are e.g., the tax-deductibility of interest payments that increases the value of the firm. However, the use of leverage also puts pressure on the management teams not to waste money. Acharya, Gottschaig, Hahn, and Kehoe (2013) found that the value created with leverage affected the average deal internal rate of return almost fifty percent in large PE transactions in Western Europe from 1991 to 2007.

In governance engineering, Kaplan and Strömberg (2009) describe that PE investors actively participate in the boards of the portfolio firms to control and affect their operations. PE investors e.g., change the whole management team if it becomes necessary. Additionally, PE investors are more actively involved in the boards of private firms than they are in public firms because the boards in private firms are smaller and they meet more often.

According to Kaplan and Strömberg (2009), and Zeisberger et al. (2017) operational value creation is the main driver in the PE market nowadays. The tools are the same whether the value is created for public corporations or PE-backed firms. However, PE firms have the reputation to succeed at value creation and, therefore PE firms are appreciated in the industry. PE firms cannot do whatever it takes to generate returns as the quality of work has also an impact on the PE firm's reputation. Operational engineering can include e.g., cutting costs, productivity improvements, or strategic changes.

Jensen (1986, 1989) describes that value can be created by making operational efficiencies, such as monitoring the firm, having management expertise, and high leverage ratios. Brav and Gompers (1997) agreed with Jensen as the better performance of VC-backed IPOs compared to non-backed IPOs was because of better management expertise and the structure of corporate governance. Additionally, Brav and Gompers observed that the reputation of the venture capitalist had also an effect on the long-term performance.

Krishnan, Ivanov, Masulis, and Singh (2011) examined more deeply the reputation of a VC financial sponsor and how it affected the long-term performance of IPOs. They found that VC owners with good reputations can choose better portfolio firms and are more involved in the portfolio firms' operations than VC owners with worse reputations. Additionally, the results revealed that reputation influenced positively the long-run after-market performance, similarly as Brav and Gompers (1997) observed. Therefore, the quality of work has an important purpose.

In turn, Katz (2009) further examined how companies' different ownership structure impacts their earnings quality and the long-term aftermarket performance. The results were in line with Jensen (1986, 1989), and Brav and Gompers (1997). PE-backed firms had higher earnings quality and better long-term performance because of professional ownership, closed monitoring, and the reputation of the PE firm. In addition, if a company had a PE firm as a majority owner, the impact on the long-term performance was even better.

2.3 Private equity exit strategies

Zeisberger et al. (2017) determine that exit is the final part of the whole PE investment process. It is the process of realizing the created value by selling the equity stake fully or partially. There are three common exit types for buyout funds: a sale to a strategic buyer,

a secondary buyout, and an IPO. This chapter covers more deeply the three strategies in addition to presenting shortly other exit strategies.

Kaplan and Strömberg (2009) found that the sale for a strategic buyer and other private equity firms were the most popular exit strategies of all global exits in 1970 to 2007, covering over 62 percent of the exits. IPOs as exit strategies were only 14 percent of the exits. According to Argentum's "The state of Nordic private equity 2019" research, there were altogether 128 VC and PE exits in the Nordic PE market in 2019. Sale to a strategic buyer was the most common type: 51 percent of buyout exits and 85 percent of venture exits. In 2019, there were only three PE-backed IPOs in the Nordic PE market.

2.3.1 Sale to a third party

Michala (2019) determines the sale to a third party as a full exit with a full cash payment. Third parties can be either strategic or financial buyers and depending on the buyer, the advantages and disadvantages of the exit differ. Cumming and MacIntosh (2003) determine that strategic buyers are usually large corporations operating in the same or similar business and are hoping to merge the target company's technology and operations with its own to gain synergies. Zeisberger et al. (2017) add that whether the target company is operating in a similar industry as the buyer, the process of due diligence is easier, and synergies are identified more easily. However, these observations may lead strategic buyers to provide higher valuations than financial buyers would.

In turn, Zeisberger et al. (2017) define that financial buyers can be e.g., PE funds, hedge funds, or family offices. The sale to another PE fund is called a secondary buyout. Financial buyers spend more time on the due diligence process and familiarize themselves with the target company's industry than strategic buyers. They are also more price sensitive. However, financial buyers are more likely to execute the exit transaction as they have determined in advance a certain amount of capital to invest in a particular investment period.

According to Zeisberger et al. (2017), the sale to a third party is a more flexible choice for PE funds than IPO since the fund has more control over the exit process and the process is executed faster with lower costs. Additionally, IPO as an exit strategy includes strict terms determined by security laws, exchange rules, and underwriters that restrict the fund's ability to control the process.

2.3.2 IPO as an exit strategy

An initial public offering is determined by Ritter and Welch (2002) as a stage of a private company's life cycle where the company is taking its shares to a stock exchange for a public offering. Zeisberger et al. (2017) separate advantages and disadvantages for an IPO as an exit strategy. The main advantages are that IPOs have historically provided the biggest returns when compared to other exit strategies. Additionally, a successful IPO process has a positive effect on the PE firm through advancing its reputation and future fundraisings. The most important disadvantages are the possibility of a failed IPO process at any stage and the costs associated with the listing. Levis (2011) adds that an IPO is also associated with liquidation consideration. When a company is going public the PE funds is not immediately getting a full exit due to lock-up agreements with underwriters. It can take several months to years to be able to sell the remaining shares.

Ritter and Welch (2002) provide two different theories for firms' decisions to go public. The first one is the life cycle theory. Zingales (1995) has presented the first formal theory of why firms go public. When companies are public, it is easier for the possible buyers to recognize the potential target companies. In addition, being public provides higher valuations for the companies as there is more information available and more potential buyers. According to Black and Gilson (1998), VC-backed IPOs are exits only for the VC funds and not for the initial owners, as the majority of the company's control is back with the founders. Chemmanur and Fulghieri (1999) describe that the life cycle of a company determines when it is worth going public. The company needs to be large enough

so that the listing costs are not too heavy, and so that the public trading adds value to the company.

The second theory categorized by Ritter and Welch (2002) is the market-timing theory. Lucas and McDonald (1990) found that IPOs proceed when there is a bull market even though the company would need to wait for more favorable market conditions. Moreover, Choe, Masulis, and Nanda (1993) supported the latter phenomenon that companies are more willing to issue equity in an expansionary stage of the business cycle. Companies are also ready to delay their IPOs if there are no other good-quality companies going public at the same time. Ritter and Welch prioritize the market conditions as the first motive to consider when going public and secondly, the life cycle of the company.

Buchner, Mohamed, and Wagner (2019) found that PE-and VC-backed firms have different reasons when going public. VC-backed firms are early-stage with bigger risks and without a proven track record and, therefore there prevails information asymmetry. The possible motive for VC-backed IPOs is to create a long-term reputation. Gompers' (1996) theory supports the reputational perspective. The theory suggests that VC funds underprice shares in order to ease their future portfolio companies' IPOs. This helps the VC funds to build a good reputation and raise capital more successfully. The motive for PE-backed IPOs to go public, according to Buchner et al., can be the size of the transactions as PE funds invest in more mature firms. Due to this reason, BO funds may divest their ownership too quickly.

2.3.3 Other exit strategies

Zeisberger et al. (2017) present dividend recapitalization as an additional exit strategy. It is a partial exit for a PE fund, where the PE fund can withdraw cash from the portfolio company and reduce its capital at risk. The cash i.e., the dividend is issued with the portfolio company's excess cash or with additional debt and is paid to the limited partners

of the fund. The recapitalization does not affect the portfolio company's ownership structure or does not dilute equity stakes.

Additionally, Cumming and MacIntosh (2003) introduce buyback and write-off as two more exit strategies. The first one is an acquisition by the initial owners of the portfolio company, in which the initial owners buy back all the outstanding shares from the financial sponsors. The latter one is a situation, where there is no future for the portfolio company and the financial sponsor writes down the initial investment.

3 Initial public offerings

In this section, initial public offerings are covered more deeply by going through the general process of going public and explaining how IPOs are valued. Additionally, anomalies associated with IPOs are presented. Firstly, underpricing theories and previous academic literature regarding aftermarket performance are introduced at a general level, and secondly, in a more detailed level, focusing on the private equity ownership perspective.

3.1 The listing process

The listing processes vary depending on the market and exchange, for example, the listing process in the Nordic countries follows a similar procedure. Espinasse (2014) describes that the overall process starts 6 to 9 months before the shares are actually traded on the public market. At the beginning of the process, the underwriters are selected, and they form a syndicate for the transaction together with e.g., independent advisors, legal advisors, and broker-dealers. Ritter (2019) determines that the number of underwriters has increased from one to almost seven underwriters for each listing during the last 10 years. According to Espinasse, the first phase in the listing process is due diligence, where the issuer's financials, business, and legal aspects are precisely examined, and a prospectus is drafted by the advisors included in the process. The finished prospectus is offered to the market regulators or the stock exchange, depending on the company's operating market.

Espinasse (2014) defines that when the prospectus is accepted, the process proceeds to the marketing phase. The senior management of the issuer presents the investment case to the research analysts that are part of their syndicate. The research analysts form initial reports based on the investment case in order to set the price range for the IPO. Additionally, the issuer can join a pre-marketing tour to discuss the details of the investment case with institutional investors. After this, the investment case is published to all

investors and investors can start subscribing the shares. The final phase of the listing process is the first day of trading with the issuing company's shares.

3.2 IPO valuation

Aggarwal, Bhagat and, Rangan (2009) determine that the valuation of IPOs is an important part of the IPO process because it drives the demand on the public market, and it allows the capital market players to value corporate assets. According to Espinasse (2014), the methods to value an IPO depend on the industry and the size of the IPO. Several methods can also be used to value a certain firm if it is operating in various industries and using one method would not be adequate. The valuation can be done with a standalone valuation or by comparing it to a listed benchmark.

Espinasse (2014) describes that IPOs are often valued by using different valuation multiples based on the firm's accounting information and comparing them to different listed benchmark multiples. Another common method is the discounted cash flow model ("DCF") that focuses on estimating the future cash flows. DCF model relies mostly on assumptions and, therefore it is significant to have accurate financial forecasts for the company.

Kim and Ritter (1999) empirically examined the use of accounting information with a comparable firm multiples approach. They used e.g., earnings multiples, sales, and cash flow multiples to value the IPOs. They found that the use of multiples of comparable firms as benchmarks did not lead to accurate valuations if the historical accounting information was used without further adjustments. The inaccuracy derived from the great variations in price-to-earnings multiples ("P/E") in the publicly traded firms. However, they found that using forecasted earnings for calculating the P/E improved the accuracy. Kim and Ritter emphasized the importance of investment bankers in the process of IPO valuation and suggested that any additional research regarding the market before determining the offer price range could improve the accuracy of the valuation.

Purnanandam and Swaminathan (2004) studied IPOs in the U.S. from 1980 to 1997 and divided their sample into three portfolios based on three different multiples to figure out if IPOs are undervalued or overvalued. The multiples were price-to-sales (“P/S”), price-to-EBITDA (earnings before interests, taxes, depreciation, and amortization), and P/E. The valuation ratios were calculated for each IPO by dividing the offer price with the comparable firm’s market multiple.

Purnanandam et al. (2004) found that IPOs were overvalued on average. In more detail, the undervalued IPOs experienced the lowest level of underpricing which is contrary to the traditional asymmetric information theories. Additionally, they examined the differences in factors between the overvalued and undervalued IPOs. Results indicated that overvalued IPOs had lower profitability and higher growth forecasts whereas undervalued IPOs had vice versa. Purnanandam et al. also suggested that the role of IPO marketing affecting the IPO pricing should be better understood since it may create excess demand for the issuing firm and causing the offer price to be higher. According to Aggarwal et al. (2009), the high level of underpricing complicates the valuation of IPOs. They studied IPOs with positive and negative earnings and how these fundamentals affected the valuation. The results indicated that IPOs with negative earnings are associated with higher valuations than IPOs with positive earnings.

3.3 Performance of IPOs

Underpricing, hot issue markets, and long-term aftermarket performance are anomalies related to IPOs. These are extensively studied and identified globally over the years but are still remaining as a focus in the IPO literature as researchers are trying to find new potential explanations for the anomalies. In the following subchapters, each anomaly and its theories are explained.

3.3.1 Underpricing

Reilly (1973) and Ibbotson (1975) have been among the first people to document that on the first trading day, issuing firm's stock price has been substantially higher than the initial offer price. Earlier studies explaining the underpricing are based on the informational asymmetry between the issuing firm, underwriter, and investors, but more recent studies have been focused on studying the behavioral aspect of investors.

The Winner's Curse theory by Rock (1986), is one of the first asymmetric information models explaining the phenomenon. According to the model, there are two types of investors in the IPO market: the informed and uninformed investors. The former investors have better information about the probable cash flows of the issuing firm and the latter investors lack information availability. Rock assumes that the informed investors invest in attractive and underpriced IPOs whereas uninformed investors invest in the overpriced IPOs. To avoid the uninformed investors leaving the market, companies price their shares on discount to the fundamental value.

Another model based on asymmetric information is presented by Baron (1982), where the issuers of the firm have limited information about the fundamental value and demand of the firm's shares compared to the investment bankers who provide advising and distribution services for the issuing firms. Uninformed issuers are in the need to trust the information received from the bankers and provide compensation to them regardless of the uncertain effort of the investment bankers. When investment bankers are more informed than issuers, the new issues are underpriced as then the shares will be trading on the first trading day.

Muscarella and Vetsuypens (1989) used Baron's findings to test if the model holds when it is replicated to investment bank IPOs and when the investment bank itself is working as an underwriter. By following Baron's findings, the investment bank's value should be correctly priced in the considered situation. However, Muscarella and Vetsuypens got contrary results to Baron's model and found that IPOs of investment banks are even

more underpriced despite the investment bank underwriting their own issues than IPOs of investment banks that do not issue their own shares.

Signaling hypothesis theory by Welch (1989) and Allen and Faulhaber (1989), show that issuing firms use underpricing to signal their firm's quality and fundamental value. The less-informed investors believe that the issuing firm is a high-quality firm and, therefore are eager to buy the cheap shares. The theory also states that with underpricing, more highly qualified firms can receive higher returns in following equity issuances.

Welch (1992) presents an *informational cascades hypothesis*, whereby investors decide to invest in IPOs if other investors have also invested in the IPO and may disregard the relevant information they carry about the firm. An issuer has the incentive to underprice an IPO so that investors would start buying the shares and, therefore get others to buy the shares also regardless of the information the investors have.

According to the *lawsuit avoidance hypothesis*, presented by Tinic (1988), issuing firms underprice to avoid legal liabilities. The hypothesis assumes that the probability of litigations is reduced when initial returns on the first trading day are positive and large. Lin's, Pukthuanthong's and Walker's (2013) study supports the hypothesis and finds a positive relationship between the litigation risk and underpricing in an international sampling. The results show that IPOs with larger litigation risks are more probable to experience a higher level of underpricing. However, Drake and Vetsuypens (1993) do not accept the hypothesis, since they find that underpricing is not an effective way of lowering the probability of litigation.

Habib and Ljungvist (2001) provide another explanation for the level of IPO underpricing and why issuers are generally accepting underpricing. IPOs may be more underpriced if issuers have no reasons to care about the level of underpricing. Issuers care about the level of underpricing and try to affect it, when there are more shares to sell and, therefore, to lose. The issuers can affect the level of underpricing by choosing the underwriter

and the exchange where to issue shares. According to Loughran and Ritter (2004), the decision-makers, CEOs or financial sponsors, behind the issuing firm prefer to choose underwriters that have a history of underpricing as then they can receive side payments.

3.3.2 Hot and cold issue markets

The phenomenon of hot and cold issue markets was firstly introduced by Ibbotson and Jaffe (1975). They determine hot issue markets as periods when new equity offerings have substantially higher initial returns and when the level of new listings is higher than on average. Additionally, Ibbotson and Jaffe concluded that if an investor can recognize a hot issue period, they are able to earn abnormal returns.

According to Ljungqvist and Wilhelm (2003), the extreme levels of underpricing cannot be explained by informational asymmetry theories but by investor behavior. The IPO markets experienced extreme levels of underpricing and multiple listings during the dot-com bubble from 1999 to 2000. Therefore, the dot-com bubble can be considered as a hot issue market. Investors were hyping and getting optimistic about the companies and their future prospects, causing the stock prices to jump. Ljungqvist and Wilhelm studied that the level of underpricing was approximately eight times bigger during the bubble than the average level of 13 percent underpricing in the U.S. IPO markets. Westerholm (2006) studied the listing activity, listing requirements, and initial returns in the Nordic IPO markets from 1991 to 2002. Findings show that firms operating in the same industry tend to cluster and list at about the same time. Industry clustering and higher listing requirements are positively related to high initial returns but negatively affect the long-run aftermarket performance. An example from Finland from 1999 to 2000 shows that the majority of the Finnish IPOs were operating in the computer and software industry.

Michala (2019) studied whether PE-backed IPOs are any different from non-backed IPOs in terms of information asymmetry, the timing of the listing, and post-IPO survival from 1975 to 2013. The results indicated that PE-backed companies did not time the listings

when the market was experiencing a hot issue market and financial sponsors did not make premature IPOs. However, if a PE-backed company was listed during a hot issue market, the probability to delist was bigger.

3.3.3 Aftermarket performance

The long-term aftermarket performance of IPOs has also been extensively studied besides the underpricing phenomenon and hot issue markets. Theories explaining the long-term performance of IPOs are based on the irrational behavior of an investor and investor sentiment. However, there are also theories arguing that the phenomenon of long-term underperformance of IPOs does not exist.

According to the *divergence of opinion hypothesis* by Miller (1977), investors have inconsistent opinions about the valuation of an IPO. The optimistic investors cause the stock prices to jump during the first trading day but their opinion changes towards the pessimistic investors' opinions when time moves on, causing the stock prices to fall. Purnanandam et al.'s (2004) results were consistent with the hypothesis. *The fads hypothesis*, presented by Shiller (1990), states that underpricing is not the reason for the positive abnormal initial returns on the IPO's first day of trading. The IPOs can be correctly valued before listing but investors overvalue the IPO on the aftermarket because of irrational over-optimistic forecasts, called "the fads".

The overconfidence hypothesis by Daniel, Hirshleifer, and Subrahmanyam (1998) argues that investors react to private information with overconfident but contrarily to the publicly available information. According to the theory, the firm is overvalued before the IPO and continues to be more overvalued after the first day of trading. However, the overvaluation does not continue for years, causing the IPO to underperform in the long run. This theory was also supported by Purnanandam et al. (2004) as their sample of IPOs were overvalued at the offer price and in the short run but returned to fair value in the long run.

The Windows opportunity hypothesis, introduced by Ritter (1991), argues that when investors are overoptimistic and overvalue a firm, issuers can sell the shares at a higher price and, thus take advantage of the windows of opportunity. Ritter examined 1526 companies going public from 1975 to 1984 in the U.S. market and their long-term performance. His results show that issuing firms underperformed 17% on average compared to a sample of matching non-issuing firms on the 3-year holding period after the initial public offering. Underperformance was worse during high activity listings and for young firms, which is consistent with the investor over-optimism and the fads hypothesis. The performance of issuing firms compared to the benchmarks was calculated with wealth relatives (“WRs”) and the mean WR was 0.83 for the sample, indicating that IPOs underperformed.

Loughran and Ritter (1995) studied IPOs and seasoned equity offerings (“SEOs”) with more extensive data from 1970 to 1990 in the U.S. market. The results are similar to Ritter’s (1991) previous research, as the IPOs and SEOs underperformed compared to the non-issuing firms on the three-year holding period but also continued in the years four and five. Loughran and Ritter determined that investors would need to invest 44 percent more money in the new issues to get the same level of wealth as investing in the non-issuing firms for five years after the first trading day.

Studies around Europe follow the evidence from the U.S. Espenlaub, Gregory, and Tonks (2000) studied the long-run performance with an extensive dataset of 588 IPOs in the UK from 1985 to 1992 by using several alternative methods e.g., CAPM, Fama-French model, size effects and RATS model as benchmarks. Additionally, both event-time returns and calendar-time returns were calculated. They found that by using the event-time approach, firms had significantly negative abnormal returns compared to all different benchmarks. Alternatively, by using the calendar-time approach, the underperformance was fairly weaker. Álvarez and Gonzáles (2005) studied IPOs in Spain from 1987 to 1997 with 3-year and 5-year holding periods. The results are in line with previous

studies about the long-term performance of IPOs even though the dataset included only 112 IPOs. Thomadakis, Nounis, and Gounopoulos (2011) studied IPOs in Greece from 1994 to 2002 with a similar approach as Ritter (1991) and Espenlaub et al. and found that during the 3-year holding period IPOs underperformed.

The long-run aftermarket performance of IPOs in the Nordic countries was studied by Westerholm (2006) from 1991 to 2002. In Finland and Sweden IPOs underperformed but Denmark and Norway contrarily outperformed the market. Finland performed slightly better than Sweden even though both countries had been affected by the dot-com bubble. Norway performed the best of the Nordic countries and outperformed the market by 3.3 percent per year since it is considered as a strong economy with high listing requirements.

Table 1. Summary of previous studies on initial and long-run performance of IPOs. Initial returns with * are market-adjusted. The last column refers to the method used to measure the long-run performance and indicates the holding period in months.

Author(s)	Market	Period	IPOs	Initial returns	Long-run	Method
Ritter (1991)	U.S.	1975-1984	1526	14,1%*	0.83	WR36
Loughran et.al (1995)	U.S.	1970-1990	4753	n/a	0.80	WR36
Espenlaub et al. (2000)	U.K.	1985-1992	588	n/a	-15,9%	CAAR36
Purnanandam et al. (2004)	U.S.	1980-1997	2288	11,4%	-19,4%	BHAR60
Àlvarez et al. (2005)	Spain	1987-1997	112	13,0%*	0.78	WR36
Westerholm (2006)	Finland	1991-2002	55	21,90 %	-41,2%	BHAR60
	Denmark		51	8,50 %	10,2%	
	Norway		102	22,20 %	38,8%	
	Sweden		82	15,90 %	-2,9%	
Thomadakis et. al (2011)	Greece		254	38,90 %	-15,4%	BHAR36

Table 1 summarizes the international evidence about the long-term performance and initial returns of IPOs. The buy-and-hold returns (“BHAR) and wealth relatives (“WR) are the most common methods to measure long-term performance but some of the previous studies used several different methods and benchmarks to calculate the performance. In that case, the most relevant method is selected for this study to be presented. To conclude based on the international evidence, IPOs have been underpriced and have underperformed consistently the benchmarks regardless of the market, time period, or the length of the holding period. The evidence on the Nordic market is not consistent and, therefore this study may clarify the evidence.

3.4 Performance of PE- and VC-backed IPOs

When focusing on IPOs backed with financial sponsors, the academic literature provides more versatile evidence. The previous academic literature regarding the performance of PE- and VC-backed IPOs are focused on the largest exchanges in the world e.g., in the U.S., UK, or France. The Nordic countries have remained as a minority in the academic literature, as the private equity market is not yet as extensive as in the U.S. or elsewhere Europe. Additionally, the results from different markets may vary because it depends on how mature investments the certain fund has made and whether it has been considered as a contributing factor.

Brav and Gompers’ study (1997) focused solely on the VC-backed IPOs in the US from 1975 to 1992. The results indicated that VC-backed IPOs performed better than non-backed IPOs over a five-year holding period in equal-weighted returns. Value-weighting the returns lowered the underperformance between the IPOs. Evidence from Japan by Hamao, Packer, and Ritter (2000) is partially contrary to the results by Brav and Gompers. Hamao et al. studied 355 Japanese IPOs from 1989 to 1995 and found that VC-backed IPOs do not perform better in the long run than other IPOs. However, if the firm was financially sponsored by a foreign-owned or independent venture capitalist, the long-run performance was better.

Bergström et al. (2006) studied the long-run performance of PE-backed IPOs and non-backed IPOs on the Paris Stock Exchange and London Stock Exchange from 1994 to 2004. The performance was considered on three different time horizons: six months, three years, and five years. Bergström et al. found that non-backed IPOs tend to be more underpriced than PE-backed IPOs and that PE-backed IPOs outperformed non-backed IPOs on average on both exchanges in each time horizon. The average underpricing was 9,33% for PE-backed IPOs and 12,87% for non-backed IPOs. The abnormal returns were negative for both VC- and PE-backed IPOs on equal- and value-weighted basis. However, the only positive returns were on the post-six-month period for PE-backed IPOs.

Levis (2011) studied the aftermarket performance of PE-backed IPOs compared to VC-backed and other non-backed IPOs on the London Stock Exchange in a time period of 1992–2005, similarly as Bergström et al. (2006). He focused also on the fundamental characteristics, as size, profitability, operational efficiency, and industry structure, and examined how these factors differ in VC- and PE-backed IPOs. Additionally, Levis combined the performance and fundamental characteristics by studying the relationship between them. Levis documented that PE-backed IPOs are generally larger in size, have more profitable sales and higher leverage ratios, and are less underpriced when compared to IPOs backed with different financial sponsors. BHARs were positive and significant for PE-backed IPOs and contrarily worse for other IPOs, following the same phenomenon as in Bergström et al. (2006) study. However, the fundamental characteristics size and book-to-market effects did not explain the better performance for PE-backed IPOs, but the level of debt and equity had a positive impact on the performance.

Bessler and Seim (2012) focused similarly as Brav and Gompers (1997) on VC-backed IPOs but in Europe and with more recent data from 1996 to 2010 and had similar results that VC-backed IPOs significantly outperformed the non-backed IPOs. However, the previous studies by Brav and Gompers, and Levis (2011) found that VC-backed IPOs have the tendency to perform poorly but Bessler and Seim reported that VC-backed IPOs

generated positive returns from the first day of trading to two years after listing and only then turned negative. Additionally, a study by Belghitar and Dixon (2011) in the UK revealed that VC-backed IPOs are less underpriced than non-backed IPOs and that VC-backed IPOs did not outperform the non-backed IPOs. They suggested that the VC's experience and capability to monitor investments may signal an important message to investors at the time of an IPO. Additionally, Belghitar and Dixon observed that studies between the U.S and UK market are not directly proportional since VC investments in the UK market are more focused on late-stage investments than in the U.S market.

A more recent study from the U.S market by Buchner, Mohamed, and Wagner (2019) examined the short-term performance but also the long-term aftermarket performance from 2000 to 2014. A difference for the earlier studies is that the non-backed IPOs were excluded from the comparison, and the study solely focused on VC- and PE-backed investments. Additionally, it was compared which financial sponsorship added more value to their companies when firm characteristics were considered.

Results from Buchner et al.'s (2019) study were contrary to Brav and Gompers' (1997) and Levis' (2011) studies as PE- and VC-backed IPOs had no significant performance difference on the 3-year holding period by using BHARs. However, the authors applied other methodologies that considered the efficient use of assets to generate returns. By using return on assets or operating margins, results were significant and showed that PE-backed IPOs outperformed the VC-backed IPOs in operating performance. In addition, Buchner et al. found that PE funds are able to add more value to their firms than VC funds. The performance differences were controlled with several firm characteristics including the size of the firm, level of debt, volatility, and market to book value.

Table 2. Summary of previous studies on long-run performance of IPOs with PE ownership. The ownership column refers to the type of financial sponsor that is the subject of research. The last column presents the method used to measure the long-run performance and also indicates the holding period in months.

Author(s)	Market	Period	Ownership	VC long-run	PE long-run	NB long-run	Method
Brav et al. (1997)	U.S.	1975-1992	VC,NB	0,88	n/a	0,71	WR60
Hamao et al. (2000)	Japan	1989-1995	VC,NB	-9,60 %	n/a	-11,60 %	BHAR36
Bergström et al. (2006)	U.K. and Paris	1994-2004	VC,PE,NB	n/a	-28,61 %	-72,94%	CAR36
Levis (2011)	U.K.	1992-2005	VC,PE,NB	-3,92 %	13,84 %	-20,2%	BHAR36
Belghitar et al. (2011)	U.K.	1992-1996	VC,NB	-13,03 %	n/a	-14,45%	BHAR36
Bessler and Seim (2012)	Europe	1996-2010	VC,NB	-6,34 %	n/a	n/a	BHAR25
Buchner et al. (2019)	U.S.	2000-2014	VC,PE	27,10 %	20,40 %	n/a	BHR36

Table 2 summarizes the previous evidence on the long-run performance with different private equity ownerships. Long-run returns of VC-backed IPOs show a pattern of underperforming their PE-backed counterparts and outperforming non-backed counterparts. The previous evidence also indicates that BHARs for VC-backed and non-backed IPOs are negative. However, BHARs for PE-backed IPOs are varying but consistently perform better than VC-backed and non-backed IPOs in the long run.

4 Data and methodology

In this chapter, the data, and methodology used to study the two research hypotheses are presented. The first hypothesis suggests that private equity ownership influences the underpricing of IPOs in the Nordic markets and the second hypothesis assumes that IPOs with PE ownership perform better in the long run than IPOs with VC ownership or without any financial sponsor. This chapter consists of four subchapters. Firstly, it is explained in more detail how the data has been collected and formed. Secondly, the Nordic private equity market is presented and thirdly, the research methodology is introduced. Lastly, the different regression models are presented.

4.1 Data description

The data for the number of IPOs, the stock prices, firm-specific characteristics, and ownership type was collected from the Thomson Reuters database. The final data sample consists of 279 IPOs. From the original data sample, some of the IPOs had to be excluded due to missing information regarding e.g., stock prices, tickers to identify the IPO, or because the IPO was not found on the web. Additionally, if a firm had not been listed at least for three years during the chosen time period, it was excluded. Iceland was also fully excluded from the Nordic countries because it was not part of the chosen benchmark. However, the exclusion of Iceland did not affect the sample significantly. The final sample may include some errors because part of the data was gathered manually but any conflicting information e.g., regarding private equity ownership or issue prices were cross-checked. The daily stock prices were gathered for the 3-year holding period and the firm-specific characteristics, revenue, EBITDA, total assets, and total debt, were gathered for the IPO date. Additionally, the market index data for the MSCI Nordic Countries index was retrieved from the Thomson Reuters database. The index comprises large and mid-cap segments in Denmark, Finland, Norway, and Sweden.

The time period considered in this study is between April 2001 and March 2018. Table 3 below separates the IPOs by country and year. The table shows that Sweden has been the most active of all countries and Denmark and Finland the most inactive during the 17-year time period. IPO markets experienced a high level of listing activity during the years 2006 and 2007 due to the bull market before the financial crisis in 2008. The year after, Nordic markets experienced a low listing activity as there was only one IPO in Norway. However, from the year 2014 to 2018, the listing activity has been higher than ever before. This indicates that the IPO market in the Nordics has developed and matured. In the next chapter, the Nordic private equity market will be explained more profoundly.

Table 3. Volume distribution across year and country. *2018 includes only 4 months.

Year	Denmark	Finland	Norway	Sweden	Total
2001	1	0	2	3	6
2002	0	1	0	4	5
2004	0	0	3	1	4
2005	0	2	3	3	8
2006	2	1	1	7	11
2007	5	1	8	8	22
2008	1	0	1	3	5
2009	0	0	1	0	1
2010	3	0	4	4	11
2011	1	0	3	7	11
2012	1	1	2	0	4
2013	3	2	4	0	9
2014	2	4	9	14	29
2015	2	9	5	26	42
2016	3	5	3	23	34
2017	3	9	8	44	64
2018*	0	5	2	6	13
Total	27	40	59	153	279

Table 4 divides the sample by the ownership type. Almost 23 percent of the total IPOs have some private equity ownership in their operations and out of the 64 PE-backed IPOs, 22 are VC-backed and 42 are PE-backed. The majority of all IPOs do not have any

financial sponsorship. After the year 2010, IPOs with private equity ownership have become more common than before but there are still more non-backed IPOs.

Table 4. IPOs by ownership type. *2018 includes only 4 months.

Year	NS	PEALL	PE	VC	Total
2001	6	0	0	0	6
2002	1	4	4	0	9
2004	2	2	0	2	6
2005	6	2	1	1	10
2006	7	4	3	1	15
2007	12	10	3	7	32
2008	5	0	0	0	5
2009	1	0	0	0	1
2010	6	5	4	1	16
2011	8	3	2	1	14
2012	3	1	0	1	5
2013	5	4	1	3	13
2014	21	8	6	2	37
2015	31	11	10	1	53
2016	30	4	4	0	38
2017	60	4	2	2	68
2018*	11	2	2	0	15
Total	215	64	42	22	279

In the next table, the firm-specific statistics such as size and operational characteristics are summarized for each IPO group. In terms of the firm size, measured as market capitalization or total assets, PE-backed companies are the largest when compared to non-backed or VC-backed companies. The market value for PE-backed companies is almost four times bigger than the market value is for the other counterparts. Between VC-backed and non-backed companies, the market value is slightly bigger for VC-backed companies, but the amount of total assets is lower than for non-backed companies.

Other operational characteristics, for example net sales and asset turnover, follow the same pattern. PE-backed companies have the highest sales of all the IPO groups and are also more effective to generate sales as the asset turnover ratio is higher. However, the

ratio should be compared with companies operating in the same industry and, therefore it cannot be interpreted unequivocally. The operating margins are slightly higher for non-backed companies than for PE-backed companies but for VC-backed companies, the EBITDA margin is the worst. The leverage ratio is substantially highest for VC-backed companies. However, the data sample for the VC-backed companies is relatively small and, therefore there can be some individuals that drive the leverage ratio up. For PE-backed companies, the leverage ratio is almost three times higher than the ratio for non-backed companies as PE-backed companies optimize the use of debt in order to enhance future returns.

As earlier discussed in this study, VC-backed companies are early-stage startups with growth potential but are currently small in terms of size and sales. On the other hand, companies backed by a growth equity fund or a buyout fund are operating in more mature businesses, are larger companies, and have higher leverage ratios. Table 5 provides evidence for the general characteristics of companies with different PE ownership.

Table 5. Descriptive statistics for the IPO group

Variable	Measure	NB (215)	PEALL (64)	PE (42)	VC (22)	ALL IPOs (279)	Unit
Market value	Median	94	222	382	99,7	117	MEUR
Net sales	Median	32	165,8	412,6	14	43	MEUR
Total assets	Median	51	159,7	310,6	40	70	MEUR
Asset turnover	Median	0,69	0,95	1,05	0,38	0,75	
EBITDA	Median	2,8	6,4	17,2	0	3	MEUR
EBITDA%	Median	8,12	4,9	7,9	0	7	%
Price to Book	Median	4,42	4,09	4,39	4,09	4,42	
Leverage	Median	23,4	52,53	59,6	359	29,74	%

Table 6 separates the data by industries. Technology, healthcare, and industrials are the most common industries in the whole data sample. When the sample is divided into different groups by PE ownership, the industry distribution is somewhat different. VC-backed companies are most focused on healthcare and the second most on technology.

In turn, PE-backed companies are most focused on consumer non-cyclicals and, secondly on industrials. The most prevalent industries among non-backed companies are healthcare, industrials, and financials. Out of the industries, Government Activity, and Academic and Educational Services are barely present in the sample.

Table 6. Relative industry distribution of IPOs.

Industry	NB	PEALL	PE	VC	All
Academic & Educational Services	0,5 %	0,0 %	0,0 %	0,0 %	0,4 %
Basic Materials	2,3 %	1,6 %	2,4 %	0,0 %	2,2 %
Consumer Cyclicals	7,9 %	26,6 %	40,5 %	0,0 %	12,2 %
Consumer Non-Cyclical	3,3 %	9,4 %	7,1 %	13,6 %	4,7 %
Energy	5,1 %	1,6 %	2,4 %	0,0 %	4,3 %
Financials	9,3 %	3,1 %	2,4 %	4,5 %	7,9 %
Government Activity	0,5 %	0,0 %	0,0 %	0,0 %	0,4 %
Healthcare	21,9 %	20,3 %	7,1 %	45,5 %	21,5 %
Industrials	15,8 %	17,2 %	26,2 %	0,0 %	16,1 %
Real Estate	6,5 %	1,6 %	0,0 %	4,5 %	5,4 %
Technology	25,1 %	18,8 %	11,9 %	31,8 %	23,7 %
Utilities	1,9 %	0,0 %	0,0 %	0,0 %	1,4 %
Total	100,0 %	100,0 %	100,0 %	100,0 %	100,0 %

Table 7 reports the annual levels of underpricing between the 17-year time period. In 2001, the annual underpricing has been almost 45% which is the highest level in the considered time period. The high level of underpricing can have some influences from the dot-com bubble in 1991 to 2000. Underpricing remained at a low level before the financial crisis in 2008, but after the crisis, IPOs were highly overpriced on average for a couple of years. Another crisis, the European debt crisis, occurred in 2012 and affected also the Nordic IPO market, leading to slightly overpriced IPOs for two years. After 2014, the levels of underpricing have remained below 10% even though the number of listings has increased a lot. To summarize, it can be noticed that the levels of underpricing and listing activity follow the state of the economy as Loughran and Ritter (2004) found.

Firstly, IPOs are underpriced on average and after the bubble bursts, IPOs become overpriced and after time moves on, IPOs return to being underpriced.

Table 7. Annual levels of underpricing. *2018 includes only 4 months.

Year	Underpricing	Number of IPOs
2001	44,68 %	6
2002	-19,88 %	5
2004	-3,93 %	4
2005	2,25 %	8
2006	-5,82 %	11
2007	3,20 %	22
2008	-19,47 %	5
2009	-40,78 %	1
2010	9,09 %	11
2011	1,62 %	11
2012	-4,57 %	4
2013	-9,66 %	9
2014	4,18 %	29
2015	1,39 %	42
2016	7,61 %	34
2017	8,79 %	64
2018	0,39 %	13

4.2 Nordic private equity market

This study focuses on the private equity market in the Nordic countries and the countries considered are Denmark, Finland, Norway, and Sweden. For the past decades, the Nordic countries have developed into a more mature market and the PE activity has increased substantially. The Nordic countries have been able to develop several success stories, such as Skype and Spotify, and the value of Nordic expertise and vision has grown.

Covid-19 has had a huge impact on PE and VC deal activity in the Nordics in 2020. As figure 3 shows, the amount of PE deals and the deal values have returned to 2017 levels. Report "Nordic Private Capital Breakdown" by Pitchbook analyzes how the PE and VC

markets have developed during 2020. PE deals were withdrawn or postponed, and financial sponsors were focusing on portfolio triage instead of making new deals. Additionally, the report revealed that almost half of the closed deals were proceeded in Sweden and the most popular sector among the deals was technology, which is in line with the industry distribution in this study.

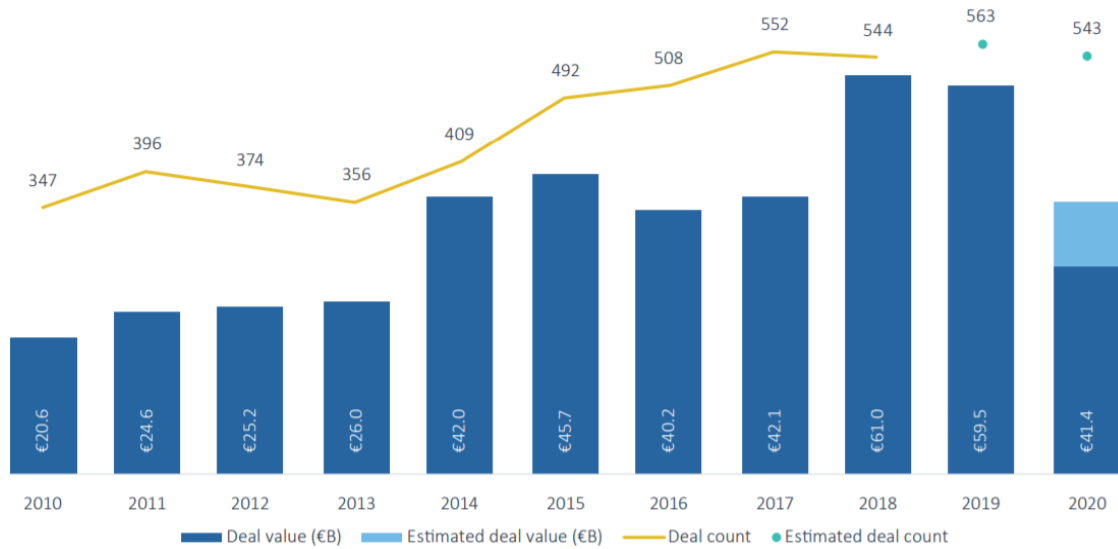


Figure 3. PE deal activity in the Nordic countries (Pitchbook 2021).

While the PE deal activity has slowed down in the Nordics in 2020, the VC deal activity has increased as the “Nordic Private Capital Breakdown” report and figure 4 indicates. The year was the best so far in the whole Nordic VC market as 5.1 billion euros has never been invested in early-stage and fast-growing startups before. Nordic countries are ideal for VC funds because the economies have e.g., large public sectors, functioning welfare systems, and willingness to fund and help new companies with accelerator and incubator programs. The deal value was driven by the big deal size, approximately 70% of all the VC deals were over 25 million euros and the trend is upward. According to the report, software was the most common sector, but fintech and digital health are also becoming more and more a focus for Nordic startups.

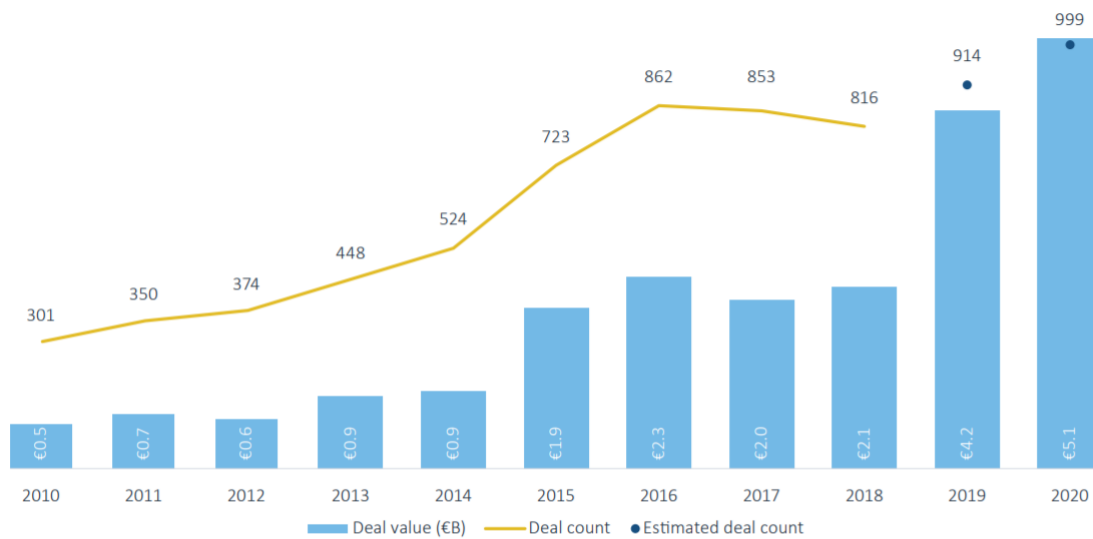


Figure 4. VC deal activity in the Nordic countries (Pitchbook 2021).

Another report by Pitchbook, “European PE Breakdown”, shows how the size of the Nordic PE market is only a small fraction of the European market and how the market did not face as a significant drop in the deals or the deal values as the Nordic market in 2020. Last year, 4179 deals were done with an accumulated value of 449.1 billion euros, compared to 2019 when 4259 deals were done with a value of 462 billion euros.

Argentum’s research “The state of Nordic private equity 2019” documented that the sustainable approach is one of the main interests among private equity funds and institutional investors in the future. By considering climate issues while advising their portfolio companies, PE funds can advance the development of sustainability significantly. Additionally, companies with e.g., innovative technologies and clear strategies with climate goals can be great investment opportunities for PE funds.

4.3 Methodology

This study focuses on examining the impact of private equity ownership on the underpricing and the long-run performance of IPOs. Underpricing is used to determine if the

IPO is under- or overvalued and by comparing the initial returns, the impacts of private equity ownership on the pricing can be identified. The long-run performance is examined by using the BHAR method and the impacts of pre-IPO ownership on the post-IPO performance are studied with four different OLS regressions. The returns are calculated by using daily prices and compared to the MSCI Nordic Countries index. All the methods follow previous academic literature on underpricing, IPOs, and private equity involvement and, therefore the use of them has an empirical justification. In this section, the methods and variables used in this study are presented in more detail.

4.3.1 Initial returns

Initial returns, in other words, underpricing, are defined as the percentage difference between the IPO offer price and the closing price on the first day of public trading as formula 1 presents. This method is stabilized in the academic literature (Ritter, 1991; Purnanandam et al., 2004; Álvarez et al, 2005) to calculate the first-day IPO returns.

$$(1) \quad \text{Initial return} = \frac{P_{\text{first day closing price}} - P_{\text{listing price}}}{P_{\text{listing price}}}$$

In addition to examining the underpricing phenomenon itself, the first-day return is also used as an independent variable in the OLS regressions. In more detail, it is used to examine how the first-day return affects the long-term performance. Bergström et al. (2006) and Levis (2011) found that VC-backed IPOs tend to have higher first-day returns than PE-backed IPOs because of the company's stage at the lifecycle and the information available. On the other hand, when compared to non-backed IPOs, the returns were even higher and, therefore were more underpriced. However, Barry, Muscarella, Peavy, and Vetsuypens (1990) found that the monitoring of VC funds has a lowering effect on the underpricing of VC-backed IPOs. On a general level, Levis reported that first-day returns had a negative impact on long-term performance.

4.3.2 Buy-and-hold abnormal returns

Previous academic literature e.g., Ritter (1991), Bergström et al. (2006), and Levis (2011), presents two different approaches to calculate the long-term performance: the cumulative abnormal returns (“CAR”) and the buy-and-hold abnormal returns (“BHAR”). Earlier studies, such as Ritter (1991) and Bergström et al. (2006), have used both methods but more recent studies like Levis (2011) have excluded the CAR method due to biased results in the long term. Therefore, to get comparable and accurate results with earlier studies, the BHAR method is followed in this study. The BHAR method is calculated as:

$$(2) \quad BHAR = \frac{1}{N} \sum_{i=1}^N [(\prod_{t=1}^T (1 + r_{it}) - (\prod_{t=1}^T (1 + r_{bt}))]$$

, where r_{it} is the raw return for one IPO and r_{bt} is similarly for the benchmark used at the event month t .

BHARs are calculated for all the IPOs by adding the whole 36-month returns to the rest of the month’s returns that is left after the first day of trading. By following the approach by Levis (2011), the timeframe for 36 months is used. According to Lyon, Barber, and Tsai (1999), long-term BHARs are positively skewed and, which leads to negatively biased t-statistics. Therefore, to remove the bias, bootstrapped skewness-adjusted t-statistics are used. It is represented in the following equations by Lyon et al.:

$$(3) \quad t_{sa} = \sqrt{n} \left(S + \frac{1}{3} \gamma S^2 + \frac{1}{6n} \gamma \right)$$

, where

$$(4) \quad S = \frac{\overline{AR_t}}{\sigma(AR_t)}$$

and

$$(5) \quad \gamma = \frac{\sum_{i=1}^n (AR_{it} - \overline{AR}_t)^3}{n\sigma(AR_t)^3}$$

\overline{AR}_t is the sample mean of BHARs, $\sigma(AR_t)$ is the cross-sectional sample standard deviation of BHARs and n is the number of firms in the sample. The coefficient γ is an estimate for the skewness.

4.3.3 Private equity ownership

Dummy variables are used to identify whether a firm has any private equity ownership pre-IPO. The ownership can be PE, VC, or not having a financial sponsor at all. PEall has a value of 1 if the firm has any PE ownership or respectively a value of 0 if the firm has no PE ownership. Dummies PE and VC can be interpreted similarly, but PE represents majority ownership of a more established company and VC minority ownership of an early- or late-stage ownership. The ownership is identified in the sample according to the Thomson Reuters database.

4.3.4 Controls

The firm size is measured as the natural logarithm of total assets. To avoid the results being driven by very large or small firms, the variable is used to normalize the data. Brav and Gompers (1997), and Bergström et al. (2000) found that firm size is one important factor explaining the returns as the results were positive and highly significant. Large firms performed better than small firms.

The *price to book* variable is calculated as the company's price per share to its book value per share. It describes whether the company is considered as a value or growth stock. A low ratio indicates a value stock and, contrarily a growth stock. The findings of Bergström et al. (2006) showed that the book-to-market effects did not explain the better

performance for PE-backed IPOs compared to IPOs backed with different financial sponsors. According to the results by Levis (2011), the coefficient is negative and significant.

The independent variable *leverage* is calculated as total debt to common equity during the year of the IPO. Levis (2011) found that leverage had a significant impact on the long-term performance of IPOs and observed that PE-backed firms had more debt than VC- or non-backed firms. PE-backed firms are more established companies than VC-backed firms and, therefore are more able to take higher amounts of leverage.

Two more independent variables are added to the latter regressions to control the operating characteristics. The first one is *asset turnover*, calculated as sales to assets, and the second one is the *operating margin*, calculated as EBITDA to total revenue. These ratios measure the operating performance and how efficiently the firm is operating. The findings of Levis (2011) showed that PE-backed firms were more efficient compared to VC-backed firms when both ratios were used.

Dummy variable is used to identify whether the market is experiencing *hot or cold periods*. The hot issue markets are identified in a similar manner as Ibbotson and Jaffe (1975) firstly introduced it. The hot issue markets are determined as periods when IPO markets are experiencing above-average initial returns, meaning that the level of underpricing is high, and the number of listings is above average or vice versa for the cold issue markets. The different market cycles in the data are identified by calculating the average initial returns and volume for the IPOs. Periods above average are considered the hot market and below average the cold market.

4.4 Regression models

Multivariate analysis is used to identify long-run performance differences between PE-backed, VC-backed, and non-backed IPOs and to find out, which factors explain the long-term performance. In this study, the regression models presented by Levis (2011) are followed.

The dependent variable is the 36-month BHAR and remains the same through all the regressions. Additionally, the hot issue market phenomenon is taken into account by having hot and cold dummy in each model. The regressions follow two different approaches. In the first regression, the firm-specific characteristics are controlled at the time of the IPO for the IPOs with any PE ownership and IPOs without PE ownership. In the second regression, the PE-and VC-backed dummies are introduced. The firm characteristics are controlled similarly at the time of the IPO but are examined separately for the groups with different ownership.

$$(6) \quad BHAR = \alpha + \beta_1 \text{first day return} + \beta_2 \log(\text{total assets}) + B_3 \text{Pricetobook} + B_4 \text{PEall} + B_5 \text{Hot/Cold} + \varepsilon$$

$$(7) \quad BHAR = \alpha + \beta_1 \text{first day return} + \beta_2 \log(\text{total assets}) + B_3 \text{Pricetobook} + B_4 \text{PE} + B_5 \text{VC} + B_6 \text{Hot/Cold} + \varepsilon$$

In the third and fourth models, the regressions are extended to study the effects of operational factors, such as asset turnover and EBITDA margin. The other explanatory variables and sample categorization remain the same.

$$(8) \quad BHAR = \alpha + \beta_1 \text{first day return} + \beta_2 \log(\text{total assets}) + B_3 \text{Pricetobook} + B_4 \text{asset turnover} + B_6 \text{EBITDA}\% + B_7 \text{leverage} + B_8 \text{PEall} + B_9 \text{Hot/Cold} + \varepsilon$$

$$(9) \quad BHAR = \alpha + \beta_1 \text{first day return} + \beta_2 \log(\text{total assets}) + B_3 \text{Pricetobook} + B_4 \text{asset turnover} + B_5 \text{EBITDA}\% + B_6 \text{leverage} + B_7 \text{PE} + B_8 \text{VC} + B_9 \text{Hot/Cold} + \varepsilon$$

5 Results

In this chapter, the results of the empirical study are presented. Firstly, the first day returns for the IPOs are given in different market cycles and separate groups with and without different PE ownerships. Secondly, BHARs for the IPOs are presented in different time periods. Additionally, F-test is given as an alternative approach to study the differences in the long-run performances of IPOs. Finally, the results for OLS regressions are reported.

5.1 Underpricing

Results for underpricing are presented in table 8. Panel A shows the results for the entire time period on equal- and value-weighted basis. In equal-weighted terms, all the IPOs have the tendency to be underpriced at 5% and 10% significance levels and the average underpricing is 3,79 %. However, when categorizing the IPOs into groups with different PE ownerships, only the underpricing of non-backed IPOs remains significant at 5% and 10% significance levels. Non-backed IPOs seem to be more underpriced than any of the other groups with an average underpricing level of 5,10 %. This is in line with findings by Bergström et al. (2006) and Belghitar and Dixon (2001) as non-backed IPOs are more underpriced than PE- and VC-backed IPOs. Surprisingly, PE-backed IPOs are underpriced, and VC-backed IPOs are overpriced, indicating that PE-backed IPOs are more underpriced. These findings are contrary to the findings of Levis (2011), although the results are insignificant.

Similarly, in value-weighted terms, all IPOs are underpriced but the level of underpricing is lower, 0,03% on average. The underpricing of non-backed IPOs is also significant on value-weighted terms at a 10% level and the level of statistical significance has also increased in the groups with PE ownership, although the results remain insignificant. The first-day returns are driven by the small-cap firms since the underpricing level in value-weighted terms is close to zero. Additionally, the returns of small-cap firms decrease the

overpricing of VC-backed IPOs. Non-backed IPOs are the least underpriced and PE-backed IPOs are still more underpriced than VC-backed IPOs.

Meggison and Weiss (1991) observed that VC-backed IPOs are less underpriced in the U.S because of the VC funds' certification role. The uncertainty of the portfolio firms is reduced when the firm is managed by a VC fund and, therefore investors are more willing to invest in an IPO. This certification cannot be observed in the Nordic market with this data sample because the results indicate that IPOs with VC ownership experience overpricing in equal-weighted terms and that non-backed IPOs experience the lowest degree of underpricing in value-weighted terms.

The overall underpricing has been higher around the world when the effect of PE ownership has not been considered. Levis (2011) observed that the average underpricing in the UK was 18,6% from 1992 to 2005 and Westerholm (2006) found similarly in the Nordic market that the average underpricing was between 8,50 and 22,20 percent from 1991 to 2002. A similar phenomenon can be observed when the effect of PE ownership has been considered. Bessler and Seim (2012) examined the European market from 1996 to 2010 and found that the average underpricing for VC-backed IPOs was 8,4%. Additionally, Bergström et al. (2006) found that the average underpricing was 9,33% for PE-backed IPOs and 12,87% for non-backed IPOs in the UK and France markets. In this study, the average underpricing is lower than the previous studies in Europe indicate.

The first hypothesis of this study assumes that private equity ownership affects the level of underpricing. H1 can be accepted because the first day returns of PE-backed and VC-backed IPOs are different from the returns of all IPOs and, therefore it can be stated that PE ownership has an effect on the level of underpricing. The direction of the impact is not clear since the level of underpricing changed by using different weighting methods.

Underpricing and the volume of IPOs in hot and cold issue markets are different. During a hot period, underpricing and the volume is higher than during a cold period in equal-

weighted terms. Additionally, compared to the entire period, the level of underpricing is also slightly higher than during a hot period. These observations are in line with the phenomenon of hot issue markets found by Ibbotson and Jaffe (1975). Underpricing for all the IPOs and non-backed IPOs is significant at a 5% level. During a cold period, the IPOs with PE ownership experience overpricing on average. However, all results for underpricing are insignificant in cold periods. In value-weighted terms, there are no clear differences in the level of underpricing among the different business cycles. The value-weighted average for all the IPOs is 0,04% and is the only one with significant results at a 5% level in hot and cold periods. Bessler and Seim (2012) found that the level of underpricing jumped to 20% during a hot issue market between 1998 to 2000. However, before the financial crisis in 2008, underpricing remained below 5%, which is similar to the levels of underpricing that table 8 reports.

Table 8. Underpricing in different business cycles. The sample consists of 279 IPOs of which 215 are non-backed, 42 PE-backed, and 22 VC-backed IPOs. Underpricing is calculated as the percentage difference between the IPO initial offer price and the closing price on the first day of public trading. * refers to statistical significance at 10% level, ** at the 5% level, and *** at the 1% level. T-statistics are given in the parentheses.

Underpricing	All	NB	PEALL	PE	VC
<i>Panel A. Entire period</i>					
Equally-weighted average	3,79%** (2.12)	5,10%** (2.36)	-0,62% (-0.22)	0,67% (0.20)	-3,09% (-0.59)
Value-weighted average	0,03%** (2.14)	0,02%* (1.80)	0,22% (1.49)	0,36% (1.49)	0,05% (0.30)
N	279	215	64	42	22
<i>Panel B. Hot period</i>					
Equally-weighted average	4,37%** (2.14)	5,81%** (2.30)	0,25% (0.08)	0,058% (0.16)	-0,58% (-0.11)
Value-weighted average	0,04%** (2.04)	0,03% (1.62)	0,27% (1.49)	0,39% (1.49)	0,10% (0.44)
N	208	154	54	39	15
<i>Panel C. Cold period</i>					
Equally-weighted average	2,11% (0.56)	3,33% (0.8)	-5,33% (-0.74)	1,94% (0.38)	-8,44% (-0.84)
Value-weighted average	0,04% (0.84)	0,05% (0.84)	0,07% (0.09)	0,57% (0.39)	0,05% (0.03)
N	71	61	10	3	7

5.2 Performance of IPOs

Results for the long-term aftermarket performance of IPOs, calculated as BHARs, are presented in table 9. The returns are given in both equal- and value-weighted terms, and are reported for 1-, 12-, 24-, and 36-month periods. MSCI Nordic Countries index is used as the benchmark.

Table 9. Buy-and-hold abnormal returns in the Nordic countries. The sample consists of 279 IPOs of which 215 are non-backed, 42 PE-backed, and 22 VC-backed IPOs. MSCI Nordic Countries index is used as the benchmark. Returns are calculated as the percentage returns from the first day close price to the end of each month that is presented in the Months -column. * refers to statistical significance at 10% level, ** at the 5% level, and *** at the 1% level. T-statistics are given in the parentheses.

Months	Equally-weighted average (%)					Value-weighted average (%)				
	All IPOs	NB	PEALL	PE	VC	All IPOs	NB	PEALL	PE	VC
N	279	215	64	42	22	279	215	64	42	22
1M	3,78%*	5,83%**	-3,08 %	0,11 %	-9,16 %	0,02%**	0,01 %	0,21%**	0,36%**	-0,14 %
	(1.80)	(2.32)	(-1.02)	(0.03)	(-1.48)	(2.26)	(0.97)	(2.06)	(2.10)	(-0.46)
12M	13,05%***	17,05%***	-0,42 %	6,63 %	-13,88 %	0,06%***	0,11%***	0,12 %	0,23 %	-0,65 %
	(3.49)	(3.82)	(-0.06)	(0.98)	(-1.05)	(2.83)	(4.40)	(0.50)	(0.57)	(-0.84)
24M	23,35%***	28,37%***	6,49 %	10,21 %	-0,62 %	0,09%***	0,13%***	0,21 %	0,35 %	0,00 %
	(4.20)	(4.26)	(0.76)	(1.23)	(0.08)	(3.62)	(4.74)	(0.85)	(0.84)	(-0.03)
36M	37,02%***	45,54%***	8,39 %	20,45%*	-14,64 %	0,15%***	0,25%***	0,26%*	0,48%**	-0,97 %
	(4.61)	(4.59)	(0.84)	(1.74)	(-0.62)	(4.10)	(3.59)	(1.96)	(2.24)	(-1.33)

Overall, there are more positive than negative BHARs for all of the groups in equal- and value-weighted terms. This observation can indicate that IPOs in the Nordic market perform generally better than the index and, which is contrary to Ritter's (1991, 1995) findings that IPOs usually underperform their benchmarks in the long run in the U.S. In turn, Westerholm (2006) found also overperformance in the Nordic countries. The average 60-month BHARs varied between -41,2% and 38,8%, which are in line with the results of this study. The average 36-month BHAR for all the IPOs is 37,02% in equal-weighted terms and 0,15% in value-weighted terms. The returns of small-cap firms drive the value-weighted returns down.

When looking IPOs with different PE owners, PE-backed IPOs outperform VC-backed IPOs in each time period and both calculation methods. This is fully consistent with Buchner et al. (2019) and partially consistent with the findings of Levis (2011), Bergström et al. (2006), who documented that PE-backed IPOs perform better than other IPO groups. Returns for PE-backed IPOs are only statistically significant at a 10% level in the 36-month period in equal-weighted terms but value-weighting the returns, the significance increases, and both first month and 36-month returns are significant at a 5% significance level. The 36-month returns for PE-backed IPOs are 20,45% in equal-weighted terms and 0,48% in value-weighted terms.

VC-backed IPOs perform the worst of all the other groups and underperform the index in almost each time period varying between -0,62% and -14,64% in equal-weighted terms and between 0,00% and -0,97% in value-weighted terms. The latter returns are so close to zero, that there is barely any underperformance and, thus it can be concluded that VC-backed IPOs perform similarly as the market index. In addition, the results for VC-backed IPOs are statistically insignificant from zero. The poor performance of VC-backed IPOs decreases the overall BHAR for the group of all IPOs with PE ownership. Brav and Gompers (1997) documented also that VC-backed performed poorly but still outperformed the non-backed IPOs in the U.S. This is partly contradicting the results of this study as non-backed IPOs perform better. However, the findings of Belghitar and Dixon (2011) support the results in this study as they found that VC-backed IPOs did not outperform the non-backed IPOs in the UK market.

When focusing on equal-weighted returns, non-backed IPOs perform the best and outperform the IPOs with different financial sponsorships. This is contrary to the prevalent evidence that e.g., Brav and Gompers (1997), Hamao (2000), Levis (2011), Bergström et al. (2006), and Belghitar et al. (2011) observed around the world. However, in value-weighted terms, IPOs with PE ownership perform better than non-backed IPOs and VC-backed IPOs and, which the findings of Levis and Bergström et al. fully supports. According to these conflicting findings, H2 could be accepted in value-weighted terms but

not in equal-weighted terms and therefore unanimous conclusion cannot be made. Thus, it cannot be concluded whether a company having a PE owner in their operations creates long-term value compared to a company not having a PE owner in their operations during the time periods considered in this study in the Nordic market. In addition, the method for calculating BHARs can affect the outcome.

Below table 10 presents F-test as another approach to examining the long-run performance differences between the groups with or without PE ownership. Similarly, as in the previous table in equal-weighted terms, non-backed IPOs perform the best and VC-backed IPOs perform the worst. Non-backed IPOs have on average twice as high returns as PE-backed IPOs. Additionally, VC-backed IPOs underperform the index on average. The results are significant at a 1% level for non-backed and PE-backed IPOs and non-backed IPOs and VC-backed IPOs. When comparing PE-backed and VC-backed IPOs, the differences are insignificant. F-test approach supports that H2 cannot be accepted as PE-backed IPOs do not perform better in the long run than the other groups.

Table 10. F-test for examining the differences in the long-run performance in a 36-month time period. * refers to statistical significance at 10% level, ** at the 5% level, and *** at the 1% level.

	PE	NB	PE	VC	NB	VC
Mean %	20,45 %	45,54 %	20,45 %	-14,64 %	45,54 %	-14,64 %
Listings	42	215	42	22	215	22
F	3,65***		1,35		4,92***	
p-value	0,00		0,25		0,00	

5.3 Multivariate regressions of 36-month aftermarket performance

Multivariate cross-sectional regressions are used to study the long-run performance further by finding out which factors explain the 36-month aftermarket performance. The results for the four different regressions are presented in table 11 below. Regressions 1

and 2 consider the IPO characteristics at the time of the offer and regressions 3 and 4 extend the models by considering the operating characteristics.

The coefficients for intercept, first-day return and hot issue market variable are all significant in each regression. The positive intercept supports the 36-month outperformance of all the IPOs. In addition, the coefficient for first-day return is positive, indicating a positive relationship between underpricing and long-run performance. However, according to previous academic literature, Purnanandam and Swaminathan (2004), and Levis (2011) found a negative correlation between underpricing and long-run performance.

Regarding the hot issue market variable, there is a negative relationship between the hot market and BHARs. When markets experience high listing activity and a company has an initial public offering, the long-run performance tends to be lower. This is consistent with Ritter's (1991) hypothesis of windows of opportunity as he found that companies underperform worse during high listing activity periods and are more overpriced than during other market periods.

The private equity ownership variables explain partially the aftermarket performance. When the PE investors are divided into two groups, PE investors have a positive influence on the long-run performance and VC investors have the contrary effect. These findings are consistent with the results in table 9 and are also supported by the prevalent evidence by Levis (2011), and Bergström (2006) who found that PE ownership has a positive effect on the long-run performance. However, the results are only significant for VC-backed IPOs and, therefore the effect of PE ownership is not clear and H2 cannot be accepted. To conclude, by following the previous academic literature, VC-backed IPOs tend to underperform in the long run, but the effect of PE ownership seems to have a positive impact on the long-run performance but is not statistically proven.

The other remaining variables do not explain the long-run performance as the variables are not significant, but the direction of the effect can be observed. Variable for size shows that smaller firms would have better 36-month BHARs, which is contradicting to the assumption of this study. Additionally, out of the other operational characteristics, leverage, price-to-book, asset turnover, and EBITDA-margin would explain the aftermarket performance only a small fraction or not at all. Levis (2011) found that leverage had a positive effect on the long-run performance of IPOs but Cao and Lerner (2009) did not find a relationship. Also, Bergström et al. (2006) did not find that book-to-market would explain the better performance for PE-backed IPOs.

Table 11. Multivariate regressions of long-run performance in a 36-month holding period. The dependent variable is the 36-month BHAR compared to the MSCI Nordic Countries index. * refers to statistical significance at 10% level, ** at the 5% level, and *** at the 1% level. T-statistics are given in the parentheses.

Variable	Regression 1	Regression 2	Regression 3	Regression 4
Intercept	1,122** (2,27)	1.287** (2,54)	1.177** (2,32)	1.369*** (2,62)
First-day return %	0,017*** (5,54)	0,017*** (5,47)	0,017*** (5,41)	0,017*** (5,37)
Log_total assets	-0,097 (-1,00)	-0,124 (-1,27)	-0,109 (-1,11)	-0,138 (-1,38)
P/B	0,000 (0,27)	0,000 (0,00)	0,000 (0,28)	0,000 (-0,01)
Asset turnover			-0,011 (-0,15)	-0,031 (-0,40)
EBITDA %			0,000 (0,18)	0,000 (0,10)
Leverage %			0,000 (0,64)	0,000 (0,62)
PEALL dummy	-0,211 (-0,91)		-0,208 (-0,88)	
VC dummy		-0,612* (-1,69)		-0,619* (-1,69)
PE dummy		1,27 (0,05)		3,19 (0,11)
HOT/COLD market dummy	-0,415* (-1,89)	-0,456** (-2,06)	-0,407* (-1,84)	-0,450** (-2,02)
Adjusted R2	0,11	0,11	0,10	0,10
N	279	279	279	279

6 Conclusions

This study examines the underpricing and long-run performance of initial public offerings (“IPO”) in the Nordic countries in time period between 2001 and 2018. More specifically, this study focuses on IPOs with different private equity (“PE”) owners and compares the levels of underpricing and the long-run performances in between the PE ownership groups. In addition, the factors explaining the long-run performance are studied. The different PE owners are venture capital (“VC”), growth equity, and buyout. In this study, PE-backed IPOs refer to growth equity and buyout-funds. The final sample consists of 279 IPOs in which 215 are non-backed, 42 PE-backed, and 22 VC-backed. The Nordic countries considered in this study are Finland, Denmark, Norway, and Sweden.

The first hypothesis of this study assumes that PE ownership influences the level of underpricing. The results are significant only for the whole sample and for non-backed IPOs in equal- and value-weighted terms. The average underpricing all the IPOs are experience is 3,79% and for non-backed 5,79%. Even though, the results are insignificant for PE- and VC-backed IPOs, the results indicate that PE-backed IPOs experience some underpricing and VC-backed IPOs experience barely or are even overpriced. According to these findings, H1 is accepted as the level of underpricing is not similar throughout the groups. Previous academic literature, e.g., studies by Bergström et al. (2006), and Belghitar and Dixon (2011), suggests that non-backed IPOs are the most underpriced which is in line with the results of this study. Following the findings of e.g., Brav and Gompers (1997), Katz (2009), and Cao and Lerner (2009), the results of this study indicate that the reputation of PE funds is considered by financial investors.

In addition, the results also show that the timing of an IPO does affect the level of underpricing and the long-run performance. During a hot issue market, the level of underpricing is higher, and the 3-year long-run performance is worse than during other periods. This is in line with the phenomenon of hot issue markets found by Ibbotson and Jaffe (1975) and the findings of Ritter (1991). These findings support also the fact that

during hot issue markets the average quality of issuing companies is lower as the threshold for equity issuance is significantly lower during a market boom.

The second hypothesis of this study is related to the long-run performance of IPOs with different PE owners. H2 suggests that PE-backed IPOs perform better in the long-run than VC- and non-backed IPOs. Buy-and-hold abnormal returns show that PE-backed IPOs outperform significantly the VC-backed IPOs but not the non-backed IPOs as previous academic literature suggests in equal-weighted terms. However, in value-weighted terms, PE-backed outperform both VC-backed and non-backed counterparts, but the performance differences are a lot smaller. Therefore, H2 could be accepted in value-weighted terms but not in equal-weighted terms. An additional approach to test the long-run performance, F-test, would support the rejection of H2. These results could indicate that PE- and VC-owners focus solely on the short-term value creation during the holding period of the target company. Moreover, the results show that the overperformance of IPOs is mainly driven by smaller companies in the Nordic market.

After all, the results of this study need to be interpreted with caution. The data for the IPOs and the issuing company's characteristics are retrieved from the Thomson Reuters database. Part of the data needed to be cross-checked with the company's web pages and annual reports. Additionally, the sample does not include all the companies listed between 2001 and 2018 because there was not enough or needed information available. The Nordic PE market is relatively young and therefore the number of IPOs backed by different PE owners is constricted and can therefore distort the overall conclusion of Nordic PE operators. However, the data sample is fairly extensive regarding the size of the Nordics and can therefore give some insight of the market.

In future research, there are several ways to extend the base study. For example, the holding period could be extended to five years to see fully comparable results with previous studies in the Nordic countries such as Westerholm (2006). Another way to extend would be to consider the impacts of Covid-19. Underpricing, short- and long-term

performances could be examined around the world during a pandemic. Additionally, the year 2020 can be considered as a hot issue market due to high listing activity and, thus it would be interesting to see the levels of underpricing and the future aftermarket performance. Moreover, as sustainability is the focus of different PE funds today, the returns from sustainable investments could be considered as contributing factors in the regression models. It would be fascinating to examine how much of the overall BHAR is explained by the returns from sustainable investments. The regression could also include a sustainability dummy to indicate if the company is clearly a “green company” or a forerunner regarding ESG-related matters.

References

- Acharya, V., Gottschalg, O., Hahn, M., & Kehoe, C. (2013). Corporate governance and value creation: Evidence from private equity. *Review of Financial Studies* 26(2), 368-402. <https://doi-org.proxy.uwasa.fi/10.1093/rfs/hhs117>
- Aggarwal, R., Bhagat, S., & Rangan, S. (2009). The impact of fundamentals on ipo valuation. *Financial Management* 38(2), 253-284. <https://doi.org/10.1111/j.1755-053X.2009.01035.x>
- Allen, F. & Faulhaber, G. R. (1989). Signalling by underpricing in the ipo market. *Journal of Financial Economics*, 23(2), 303–323.
- Àlvarez, S., & González, V. (2005). Signalling and the long-run performance of Spanish initial public offerings. *Journal of Business Finance & Accounting*, 32 (1-2),325–350. 32:1–2, 325–350. <https://doi.org/10.1111/j.0306-686x.2005.00596.x>
- Abril, D. (2020, December 10). Airbnb shares skyrocket 135% on first day of trading. *Fortune*. <https://fortune.com/2020/12/10/airbnb-ipo-shares-first-day-of-trading-debut-brian-chesky-abnb/>
- Argentum (2019). *The state of Nordic private equity 2019*. . <https://r.wrepite.net/argentum/stateofnordicPE2019/40/sec/1#report-top>
- Baron, D. (1982). A model of the demand for investment banking advising and distribution services for new issues. *Journal of Finance*, 37.
- Barry, B., Muscarella, C. J., Peavy, J. W., & Vetsuypens, M. R. (1990). The role of venture capital in the creation of public companies: Evidence from the going-public process. *Journal of Financial Economics*, 27(2), 447-471.

- Belghitar, Y., & Dixon, R. (2011). Do venture capitalists reduce underpricing and underperformance of ipos? *Applied Financial Economics*, 22(1), 33-44. <https://doi-org.proxy.uwasa.fi/10.1080/09603107.2011.597720>
- Bergström, C., Nilsson, D., & Wahlberg, M. (2006). Underpricing and long-run performance patterns of European private-equity-backed and non-private-equity-backed ipos. *Journal of Private Equity*, 9(4), 16-47. <https://doi.org/10.3905/jpe.2006.650457>
- Bessler, W., & Seim, M. (2012). The performance of venture-backed ipos in Europe. *Venture Capital*, 14(4), 215-239. <https://doi-org.proxy.uwasa.fi/10.1080/13691066.2012.702447>
- Black, B.S., & Gilson, R. J. (1998). Venture capital and the structure of capital markets: Banks versus stock markets. *Journal of Financial Economics*, 47(3), 243-277. [https://doi.org/10.1016/S0304-405X\(97\)00045-7](https://doi.org/10.1016/S0304-405X(97)00045-7)
- Brav, A., & Gompers, P. (1997). 'Myth or reality?' The long-run underperformance of initial public offerings: Evidence from venture and nonventure capital-backed companies. *Journal of Finance*, 52(5), 1791-1821. <https://doi.org/10.1111/j.1540-6261.1997.tb02742.x>
- Buchner, A., Mohamed, A., & Wagner, N. (2019). Are venture capital and buyout backed ipos any different? *Journal of International Financial Economics, Institutions and Money*, 60, 39-49. <https://doi.org/10.1016/j.intfin.2018.12.002>
- Cao, J., & Lerner, J. (2009). The performance of reverse leveraged buyouts. *Journal of Financial Economics*, 91(2), 139-157. <https://doi.org/10.1016/j.jfineco.2008.03.002>
- Cumming, D.J., & MacIntosh, J.G. (2003). A cross-country comparison of full and partial exits. *Journal of Banking and Finance*, 27, 511-548. [https://doi.org/10.1016/S0378-4266\(02\)00389-8](https://doi.org/10.1016/S0378-4266(02)00389-8)

- Daniel, K., Hirshleifer, D., & Subrahmanyam, A. (1998). A theory of overconfidence, self-attribution, and security market under- and overreactions. *Journal of Finance*, 53(6), 1839-1886. <http://dx.doi.org/10.2139/ssrn.2017>
- Drake, P.D., & Vetsuypens, M.R. (1993). Ipo underpricing and insurance against legal liability. *Financial Management*, 22(1), 64-73. <https://doi.org/10.2307/3665966>
- Espenlaub, S., Gregory, A., & Tonks, I. (2000). Re-assessing the long-term underperformance of UK initial public offerings. *European Financial Management*, 6(3), 319-342. <https://doi.org/10.1111/1468-036X.00127>
- Espinasse, P. (2014). *Ipo: A global guide, expanded* (2nd ed.). Hong Kong University Press.
- Gompers, P. (1996). Grandstanding in the venture capital industry. *Journal of Financial Economics*, 42(1), 133-156. [https://doi.org/10.1016/0304-405X\(96\)00874-4](https://doi.org/10.1016/0304-405X(96)00874-4)
- Habib, M., & Ljungqvist, A. (2001). Underpricing and entrepreneurial wealth losses in ipos: Theory and evidence. *Review of Financial Studies* 14(2), 433-458.
- Hamao, Y., Packer, F., & Ritter, J. (2000). Institutional affiliation and the role of venture capital: Evidence from initial public offerings in Japan. *Pacific-Basin Finance Journal* 8(5), 529-558. [https://doi.org/10.1016/S0927-538X\(00\)00026-3](https://doi.org/10.1016/S0927-538X(00)00026-3)
- Ibbotson, R. G. (1975). Price performance of common stock new issues. *Journal of Financial Economics*, 2(3), 235-272.
- Ibbotson, R. G., & Jaffe, J. F. (1975). "Hot issue" markets. *Journal of Finance*, 30(4), 1027-1042. <https://doi.org/10.1111/j.1540-6261.1975.tb01019.x>
- Jensen, M. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review*, 76, 323-329.
- Jensen, M. (1989). Eclipse of the public corporation. *Harvard Business Review*, 67(5), 61.

- Kaplan, S., & Strömberg, P. (2009). Leveraged buyouts and private equity. *Journal of Economic Perspectives*, 23(1), 121-146.
<http://dx.doi.org.proxy.uwasa.fi/10.1257/jep.23.1.121>
- Katz, S. P. (2009). Earnings quality and ownership structure: The role of private equity sponsors. *Accounting Review*, 84(3), 623-658.
- Kim, M. & Ritter, J.R. (1999). Valuing ipos. *Journal of Financial Economics*, 53(3), 409-437. [https://doi.org/10.1016/s0304-405x\(99\)00027-6](https://doi.org/10.1016/s0304-405x(99)00027-6)
- Krishnan, C.N.V., Ivanov, V. I., Masulis, R. W., & Singh, A. K. (2011). Venture capital reputation, post-ipo performance, and corporate governance. *Journal of Financial and Quantitative Analysis* 46(5), 1295-1333.
- Levis, M. (2011). The performance of private equity-backed ipos. *Financial Management*, 40(1), 253-277. <https://doi.org/10.1111/j.1755-053X.2010.01141.x>
- Lin, H.L, Pukthuanthong, K., & Walker, T. J. (2013). An international look at the lawsuit avoidance hypothesis of ipo underpricing. *Journal of Corporate Finance*, 19, 56-77. <https://doi.org/10.1016/j.jcorpfin.2012.10.003>
- Ljungqvist, A., & Wilhelm, W. J. (2003). Ipo pricing in the dot-com bubble. *Journal of Finance*, 58(2), 723-752.
- Loughran, T., & Ritter, J. R. (1995). The new issues puzzle. *Journal of Finance*, 50(1), 23. <https://doi.org/10.1111/j.1540-6261.1995.tb05166.x>
- Loughran, T., & Ritter, J. R. (2004). Why has ipo underpricing changed over time? *Financial Management*, 33(3), 5-37. <https://doi.org/10.2139/ssrn.331780>

- Lyon, J., Barber, B., & Tsai, J. (1999). Improved methods for tests of long-run abnormal stock returns. *Journal of Finance*, 54, 165-201.
- Meggingson, W. L., & Weiss K. A (1991). Venture capitalist certification in initial public offerings. *Journal of Finance*, 46(3), 879-903. <https://doi-org.proxy.uwasa.fi/10.2307/2328547>
- Michala, D. (2019). Are private equity backed initial public offerings any different? Timing, informational asymmetry and post-ipo survival. *Journal of Corporate Finance*, 59, 31-47. <https://doi.org/10.1016/j.jcorpfin.2016.10.005>
- Miller, E. M. (1977). Risk, uncertainty and divergence of opinion. *Journal of Finance*, 32(4), 1151-1168. <https://doi.org/10.1111/j.1540-6261.1977.tb03317.x>
- Muscarella, C., & Vetsuypens, M. (1989). A simple test of Baron's model of ipo underpricing. *Journal of Financial Economics*, 24(1), 125-135.
- Pitchbook. (2021). *European pe breakdown*. <https://pitchbook.com/news/reports/2020-annual-european-pe-breakdown>
- Pitchbook. (2021). *Nordic private capital breakdown*. <https://pitchbook.com/news/reports/2021-nordic-private-capital-breakdown>
- Purnanandam, A., & Swaminathan, B. (2004). Are ipos really underpriced? *Review of Financial Studies*, 17(3), 811-848. <https://doi.org/10.1093/rfs/hhg055>
- Reilly, F. K. (1973). Further evidence on short-run results for new issue investors. *Journal of Financial and Quantitative Analysis*, 8(1), 83-90. <https://doi-org.proxy.uwasa.fi/10.2307/2329750>
- Ritter, J.R. (1991). The long-run performance of initial public offerings. *Journal of Finance*, 45(1), 3-27. <https://doi.org/10.1111/j.1540-6261.1991.tb03743.x>

- Ritter, J. R., & Welch, I. (2002). A review of ipo activity, pricing and allocations. *Journal of Finance*, 57 (4), 1795-1828. <https://doi.org/10.1111/1540-6261.00478>
- Ritter, J. R. (2019). *Initial public offerings: Statistics*. Warrington College of Business, University of Florida. <https://site.warrington.ufl.edu/ritter/files/IPOs-Underwriting.pdf>
- Rock, K. (1986). Why new issues are underpriced. *Journal of Financial Economics*, 15 (1), 187-212. [https://doi.org/10.1016/0304-405x\(86\)90054-1](https://doi.org/10.1016/0304-405x(86)90054-1)
- Shiller, R. J. (1990). Speculative prices and popular models. *Journal of Economic Perspectives*, 4(2), 55-65.
- StockAnalysis. (2021). *Ipo statistics*. Retrieved from: <https://stockanalysis.com/ipos/statistics/>
- Thomadakis, S., Nounis, C., & Gounopoulos, D. (2011). Long-term performance of Greek ipos. *European Financial Management*, 18(1), 117-141. <https://doi.org/10.1111/j.1468-036X.2010.00546.x>
- Tinic, S. M. (1988). Anatomy of initial public offerings of common stock. *Journal of Finance*, 43(4), 789-822.
- Welch, I. (1989). Seasoned offerings, imitation costs, and the underpricing of initial public offerings. *Journal of Finance*, 44(2), 421-449. <https://doi.org/10.1111/j.1540-6261.1989.tb05064.x>
- Welch, I. (1992). Sequential sales, learning, and cascades. *Journal of Finance*, 47(2), 695-732. <https://doi.org/10.1111/j.1540-6261.1992.tb04406.x>
- Westerholm, P. J. (2006). Industry clustering in Nordic initial public offering markets. *International Review of Finance*, 6(1-2), 25-41. <https://doi.org/10.1111/j.1468-2443.2007.00058.x>

Zeisberger, C., Pahl, M., & White, B. (2017). *Mastering Private Equity*. Wiley.

Zingales, L. (1995). Insider ownership and the decision to go public. *Review of Economic Studies*, 62, 425-448.

Appendices

Appendix 1. The sample

Issue date	Issuer	Issue date	Issuer
04/05/2001	Consorte Group ASA	08/06/2015	Pihlajalinna Oy
06/06/2001	BTS Group AB	09/06/2015	Magnolia Bostad AB
18/06/2001	Statoil ASA	10/06/2015	Collector AB
20/06/2001	Danware Data A/S	10/06/2015	Inission AB
26/06/2001	Vitrolife AB	10/06/2015	Vistin Pharma ASA
31/08/2001	RNB Retail and Brands AB	16/06/2015	Hovding Sverige AB
08/03/2002	QPR Software Plc	16/06/2015	Coor Service Management Holding AB
17/05/2002	Alfa Laval AB	17/06/2015	Alimak Group AB
07/06/2002	Intrum Justitia AB	18/06/2015	Nobina AB
19/06/2002	Ballingslov International AB	18/06/2015	Pandex AB
19/06/2002	Nobia AB	19/06/2015	Europris ASA
11/03/2004	Opera Software ASA	26/06/2015	Hugo Games A/S
25/03/2004	Yara International ASA	30/06/2015	Capio AB
28/05/2004	MediStim ASA	07/07/2015	Kotipizza Group Oy
02/12/2004	Probi AB	21/07/2015	FIT Biotech Oy
24/02/2005	PetroJack ASA	08/10/2015	CLX Communications AB
18/04/2005	Neste Oy	16/10/2015	Bravida Holding AB
27/05/2005	AffectoGenimap Oy	02/11/2015	Skandiabanken ASA
05/10/2005	Indutrade AB	02/11/2015	Kid ASA
24/10/2005	Powel ASA	12/11/2015	Fiber Access Holding AB
04/11/2005	Biotec Pharmacon ASA	25/11/2015	Dometic Group AB
09/11/2005	Orexo AB	02/12/2015	A City Media AB
08/12/2005	Hakon Invest AB	02/12/2015	Scandic Hotels Group AB
23/02/2006	KappAhl AB	02/12/2015	Evli Pankki Oy
04/05/2006	Electra Gruppen AB	03/12/2015	Camurus AB
22/05/2006	Dios Fastigheter AB	08/12/2015	Stillfront Group AB
07/06/2006	Insplanet AB	11/12/2015	Consti Oy
13/06/2006	Salcomp Oy	11/12/2015	Nilsson Special Vehicles AB

29/06/2006	Wirtek A/S	10/02/2016	Scandinavian Tobacco Group A/S
05/09/2006	Melker Schorling AB	16/03/2016	Garo AB
15/09/2006	Biovitrum AB	17/03/2016	LeoVegas AB
17/09/2006	Marine Farms ASA	22/03/2016	Humana AB
13/11/2006	LifeCycle Pharma A/S	31/03/2016	Suomen Hoivatilat Oy
15/12/2006	Tilgin AB	26/04/2016	Nepa AB
13/02/2007	Enalyzer A/S	28/04/2016	Lehto Group Oy
15/03/2007	Mobwatcher AB	29/04/2016	Resurs Holding AB
23/03/2007	NEAS ASA	03/05/2016	Tokmanni Group Corp
27/03/2007	Algeta ASA	31/05/2016	Paradox Interactive AB
30/03/2007	Esoft Systems A/S	08/06/2016	B2Holding ASA
08/05/2007	SalMar ASA	09/06/2016	DONG Energy A/S
16/05/2007	Nederman Holding AB	13/06/2016	B3IT Management AB
21/05/2007	Cecon ASA	14/06/2016	TF Bank AB
25/05/2007	Protector Forsikring ASA	16/06/2016	GomSpace Group AB
29/05/2007	Exiqon A/S	17/06/2016	Norwegian Finans Holding ASA
12/06/2007	SRV Yhtiot Oy	22/06/2016	Lauritz.com Group A/S
21/06/2007	Grieg Seafood ASA	29/07/2016	Maha Energy AB
11/10/2007	Pronova BioPharma ASA	29/07/2016	ExpreS2ion Biotech Holding AB
12/10/2007	Systemair AB	29/09/2016	Internationella Engelska Skolan i Sverige Holdings II AB
19/10/2007	HMS Industrial Networks AB	03/11/2016	Cellink AB
26/10/2007	West International AB	10/11/2016	Heeros Oy
01/11/2007	Avega AB	22/11/2016	THQ Nordic AB
08/11/2007	Erria A/S	23/11/2016	Alligator Bioscience AB
14/11/2007	Duni AB	24/11/2016	SERNEKE Group AB
22/11/2007	Vinovo AB	30/11/2016	DNA Oy
17/12/2007	Aker Philadelphia Shipyard ASA	30/11/2016	Volati AB
20/12/2007	Trifork A/S	01/12/2016	Arcus ASA
27/05/2008	Trygga Hem Skandinavien AB	05/12/2016	ByggPartner i Dalarna Holding AB
18/06/2008	Senzime AB	07/12/2016	Smart Eye AB

23/06/2008	PCI Biotech Holding ASA	09/12/2016	Edgware AB
11/07/2008	Prime Office A/S	16/12/2016	Aino Health AB
03/10/2008	Global Health Partner AB	19/12/2016	Acarix AB
22/12/2009	Pertra ASA	22/12/2016	SeaTwirl AB
05/02/2010	North Energy ASA	22/02/2017	Oncopeptides AB
24/03/2010	Arise Windpower AB	28/02/2017	IRLAB Therapeutics AB
21/05/2010	Bridge Energy ASA	23/03/2017	Next Games Oy
28/05/2010	True Heading AB	23/03/2017	MIPS AB
02/06/2010	Byggmax Group AB	29/03/2017	Biovica International AB
03/06/2010	Chr Hansen Holding A/S	31/03/2017	Ambea AB
30/06/2010	Morpol ASA	04/04/2017	Isofol Medical AB
07/07/2010	Pallas Group AB	04/04/2017	Fondia Oy
05/10/2010	PANDORA A/S	06/04/2017	SSM Holding AB
24/11/2010	Zealand Pharma A/S	07/04/2017	BerGenBio ASA
10/12/2010	Gjensidige Forsikring ASA	07/04/2017	Actic Group AB
02/02/2011	Ecomb AB	10/04/2017	FM Mattsson Mora Group AB
29/03/2011	Norway Royal Salmon ASA	05/05/2017	Bambuser AB
15/04/2011	Karolinska Development AB	11/05/2017	Instalco AB
20/05/2011	FinnvedenBulten AB	15/05/2017	Integrum AB
25/05/2011	AroCell AB	16/05/2017	Kamux Oy
26/05/2011	Moberg Derma AB	19/05/2017	Munters Group AB
27/05/2011	Transmode Holding AB	23/05/2017	Medicover AB
23/06/2011	Boule Diagnostics AB	24/05/2017	Abelco AB
05/07/2011	Hoegh LNG Holdings Ltd	29/05/2017	Ayima Group AB
07/07/2011	Danske Andelskassers Bank A/S	30/05/2017	TerraNet Holding AB
02/12/2011	Hofseth Biocare ASA	31/05/2017	Boozt AB
14/06/2012	Selvaag Bolig ASA	01/06/2017	Western Bulk ASA
15/10/2012	Siili Solutions Oy	13/06/2017	SpareBank 1 Ostlandet
18/10/2012	Borregaard ASA	16/06/2017	Nitro Games Oy
20/03/2013	Asetek A/S	21/06/2017	Sedana Medical AB
26/03/2013	EAM Solar ASA	21/06/2017	Bonesupport Holding AB

09/04/2013	Serodus ASA	21/06/2017	Fastighets AB Trianon
28/06/2013	Matas A/S	23/06/2017	Conferize A/S
05/07/2013	Ocean Yield ASA	21/07/2017	Seamless Distribution Systems AB
03/09/2013	NorDiag ASA	21/09/2017	SenzaGen AB
14/10/2013	Orava Asuinkiinteistöraasto Oy	28/09/2017	Inhalation Sciences Sweden AB
28/11/2013	Restamax Oy	29/09/2017	Rovio Entertainment Oy
06/12/2013	Napatech A/S	29/09/2017	Infront ASA
21/02/2014	Bufab AB	02/10/2017	Sparebank 1 Nordvest
13/03/2014	ISS A/S	06/10/2017	Balco Group AB
21/03/2014	Hemfosa Fastigheter AB	10/10/2017	Handicare Group AB
03/04/2014	Recipharm AB	11/10/2017	Terveystalo Oy
08/04/2014	Vardia Insurance Group ASA	11/10/2017	Webstep ASA
09/04/2014	D Carnegie & Co AB	12/10/2017	BioArctic AB
11/04/2014	Scanship Holding ASA	13/10/2017	Climeon AB
22/04/2014	Saniona AB	13/10/2017	WeAreQiiwi Interactive AB
11/06/2014	Herantis Pharma Oy	19/10/2017	Global Gaming 555 AB
12/06/2014	Besqab AB	27/10/2017	Bibbinstruments AB
17/06/2014	Com Hem Holding AB	27/10/2017	Self Storage Group ASA
19/06/2014	Bactiguard Holding AB	06/11/2017	Bublar Group AB
20/06/2014	Zalaris ASA	08/11/2017	Crayon Group Holding ASA
27/06/2014	Scandi Standard AB	16/11/2017	Gofore Oy
01/07/2014	cXense AS	16/11/2017	Seafire AB
01/07/2014	Havyard Group ASA	17/11/2017	Orphazyme A/S
26/09/2014	Inwido AB	22/11/2017	Touchtech AB
29/09/2014	Aker Kvaerner ASA	22/11/2017	IRRAS AB
02/10/2014	Scatec Solar ASA	24/11/2017	2cureX AB
03/10/2014	XXL ASA	24/11/2017	TCM Group A/S
10/10/2014	Granges AB	06/12/2017	Tempest Security AB
16/10/2014	Absolent Group AB	07/12/2017	DevPort AB
17/10/2014	Entra ASA	08/12/2017	Efecte Oy
14/11/2014	Nexstim Oy	08/12/2017	Mag Interactive AB
21/11/2014	Lifco AB	11/12/2017	Acconeer AB

24/11/2014	United Bankers Plc	12/12/2017	Lyko Group AB
04/12/2014	NP3 Fastigheter AB	12/12/2017	Colabitoil Sweden AB
05/12/2014	Nixu Oy	13/12/2017	Toadman Interactive AB
12/12/2014	Tobin Properties AB	22/12/2017	Hitech & Development Wireless Sweden Holding AB
06/02/2015	Ferratum Oy	04/01/2018	Obstecare AB
06/02/2015	Eltel AB	09/01/2018	CGit Holding AB
13/02/2015	Dustin Group AB	15/01/2018	InfraCom Group AB
18/02/2015	The Lexington Company AB	09/02/2018	Admicom Oyj
06/03/2015	NNIT A/S	20/03/2018	Fjordkraft Holding ASA
16/03/2015	Detection Technology Oy	22/03/2018	Harvia Oyj
20/03/2015	Evolution Gaming Group AB	22/03/2018	Elkem ASA
25/03/2015	Hoist Finance AB	23/03/2018	Green Landscaping Holding AB
27/03/2015	Asiakastieto Group Oy	23/03/2018	Altia Oyj
27/03/2015	Troax Group AB	28/03/2018	BBS Bioactive Bone Substitutes Oy
24/04/2015	Tobii AB	06/04/2018	Iconovo AB
21/05/2015	Robit Plc	18/04/2018	Fluicell AB
22/05/2015	Multiconsult ASA	24/04/2018	Enersense International Oy
02/06/2015	SciBase Holding AB		