

WHEN PRIVATE EQUITY BECOMES LESS PRIVATE

**A STUDY OF AFTERMARKET PERFORMANCE OF PRIVATE
EQUITY-BACKED COMPANIES**

EDWIN ASHNAI

HARIS VALJEVAC

Bachelor Thesis

Stockholm School of Economics

2019



When Private Equity Becomes Less Private: A Study of Aftermarket Performance of Private Equity-backed Companies

Abstract:

An Initial Public Offering (IPO) is a common exit path for private equity firms. However, the underlying determinants of the aftermarket performance of such listings are limited, particularly in the Nordic region. This thesis consequently intends to test five hypotheses regarding factors that may determine the post-IPO performance of Nordic private equity-backed companies. As a key step in testing these hypotheses, the performance difference between private equity-backed IPOs and non-private equity-backed IPOs is also examined. Using a sample of 309 IPOs taking place between 2001 and 2016, we find that private equity-backed companies tend to outperform their non-private equity-backed counterparts. Evidence regarding the underlying determinants of stock performance is mixed. Though, we find evidence pointing towards that a large retained ownership at IPO by the private equity firm positively affects the aftermarket performance of the portfolio company.

Keywords:

Private equity, IPO, Aftermarket performance, Determinants of performance

Authors:

Edwin Ashnai (23818)
Haris Valjevac (23744)

Tutors:

Ran Guo, Visiting Teacher, Department of Finance

Examiner:

Adrien d'Avernas, Assistant Professor, Department of Finance

Bachelor Thesis

Bachelor Program in Business & Economics

Stockholm School of Economics

© Edwin Ashnai and Haris Valjevac, 2019

Contents

1.	INTRODUCTION	4
1.1.	Purpose	6
1.2.	Research questions	6
1.3.	Definitions and delimitations.....	6
2.	PREVIOUS LITERATURE	9
2.1.	Background.....	9
2.1.1.	Introduction to IPOs	9
2.1.2.	IPOs in a private equity context	10
2.1.3.	“Access to capital” hypothesis	10
2.1.4.	“Retained ownership” hypothesis	11
2.1.5.	“Holding period” hypothesis	12
2.1.6.	“Valuation level” hypothesis	12
2.1.7.	“IPO volume” hypothesis	13
2.2.	Hypothesis development	13
2.2.1.	Difference in performance between PE-backed and non-PE-backed IPOs	13
2.2.2.	“Access to capital” hypothesis	13
2.2.3.	“Retained ownership” hypothesis	14
2.2.4.	“Holding period” hypothesis	14
2.2.5.	“Valuation level” hypothesis	14
2.2.6.	“IPO volume” hypothesis	15
3.	DATA AND METHODOLOGY	16
3.1.	Data.....	16
3.1.1.	Data collection process.....	16
3.1.2.	Initial sample generation	16
3.1.3.	Classification of IPOs.....	16
3.1.4.	Collection of company specific data	17
3.1.5.	Data criticism	17
3.2.	Methodology.....	18
3.2.1.	Considerations	18
3.2.2.	Performance measurements.....	18
3.2.3.	Benchmarking	21
3.2.4.	Time regimes.....	22
3.2.5.	Test statistics	23
4.	RESULTS.....	24

4.1.	Descriptive statistics	24
4.2.	Aftermarket performance and its determinants	26
4.2.1.	Difference in performance between PE-backed and non-PE-backed IPOs	26
4.2.2.	“Access to capital” hypothesis	28
4.2.3.	“Retained ownership” hypothesis	29
4.2.4.	“Holding period” hypothesis	31
4.2.5.	“Valuation level” hypothesis	32
4.2.6.	“IPO volume” hypothesis	33
4.3.	Robustness testing	35
5.	IMPLICATIONS AND CONCLUSIONS.....	39
6.	REFERENCES	41
7.	APPENDICES	43

1. Introduction

Private equity (PE) is becoming an increasingly common way of investing. 20 years ago, global buyout deal value was less than \$100Bn. The corresponding figure today is \$582Bn (Bain report, 2019). In addition, PE-backed Initial Public Offerings (IPOs) have accounted for 40-50% of total European IPO activity in recent years (PwC report, 2018). On the back of the ongoing discussions whether private equity creates long-term value (Kaplan & Strömberg, 2009), the media on many occasions take the opportunity to portray private equity firms as destroyers of companies when their IPOs are unsuccessful. A prime example of this, is the attention received by OW bunker, a company taken public by the Nordic private equity firm Altor in 2014 which later went bankrupt later the same year (“Miljarder värdelösa i OW Bunker”, 2014). Part of public perception is thus negative toward IPOs backed by private equity firms. However, the question remains if newspapers catch anomalies like OW Bunker or if private equity is overall underperforming. This is what has raised our interest and will act as the foundation of this thesis.

Private equity firms' general business model is to hold companies for a limited amount of time, with an average holding period of around 5 years until full exit (PwC report, 2018). When divesting the portfolio company, there are three possible routes to take: trade sale, sale to another sponsor or to IPO the company and sell their stakes on the public market. Between the years 1970-1984, 28% of PE-backed companies were exited through IPO. The figure has since then gradually declined, reaching 11% in 2003-2005 and 1% in 2006-2007 (Kaplan & Strömberg, 2009). In 2018, the figure has rebounded to 40% on a European level and around 33% in the Nordics (PwC report, 2018; BVCA report, 2018). Moreover, private equity backing differs in several respects compared to alternative ownership structures. Ergo, an examination of the portfolio companies' aftermarket performance is relevant, since the differences in characteristics presumably will be reflected in the stock price. While a large part of existing research has put considerable emphasis on the underpricing phenomenon (e.g. Schöber, 2008; Levis, 2009; Gohil & Vyas, 2015), we believe it is a topic that deserves a study of its own. This thesis thus focuses almost exclusively on the determinants of the post-IPO stock performance for private equity-backed companies on a time frame longer than the first day return. As a key step in examining this, the PE-backed IPOs' aftermarket performance will be compared to that of non-PE-backed IPOs. Thereafter, we dive into how five different aspects may influence the stock performance of PE-backed companies. Empirical evidence for the stock performance of PE-backed IPOs will have relevance for a wide range of equity investors as well as for private equity professionals and limited partners (LPs).

A great many previous studies show that IPOs in general underperform the market, but that the PE-backed IPOs outperform their non-PE-backed counterparts (e.g. Ritter,

1991; Schöber, 2008). Potential explanations for this include that private equity ownership is characterised by, among other things, an experienced investment professional team creating operational excellence as well as active governance (Kaplan & Strömberg 2009). While several other studies have been done on the U.S. and European markets (e.g. Ritter, 1991; Loughran & Ritter, 1995; Schöber 2008), research on the Nordic market specifically remains scarce. What also characterises a lot of the previous research is a strong – or sometimes sole – focus on determining performance discrepancies between sub-groups of IPOs. This paper commences in a similar way, comparing the stock performance between PE-backed IPOs and their non-PE-backed counterparts. However, the lion share of our research will revolve around the underlying determinants of performance of PE-backed IPOs. We have identified five testable hypotheses regarding the underlying determinants of post-IPO performance of PE-backed companies. First, private equity is characterised by a large access to capital (Demiroglu & James, 2010; Kaplan & Strömberg, 2009). This may enable the portfolio companies to take strategic routes they may not otherwise have been able to take under a different ownership. Second, the smaller ownership stake that the private equity firm retains after IPO, the less effort is likely to be put into that company; this may subsequently entail a negative effect on stock performance. Third, if a private equity firm IPO its portfolio company shortly after their investment, chances are they have not had the time to make any improvements in the company which will be evident after the company has been taken public. Fourth, PE-backed companies that are taken public during windows of high valuations will exhibit underperformance. Fifth, PE-backed companies that are taken public during times of high IPO volume on the overall market will show underperformance.

In order to test the mentioned hypotheses, 309 Nordic IPOs, of which 58 are PE-backed, occurring between January 2001-May 2016 are analysed. The reason for looking at the Nordic exchanges, in addition to the previously mentioned scarce amount of research in the region, is because of the highly developed private equity market in the region, having the third highest amount of Assets under Management (AuM) in Europe (EVCA, 2014).

Our results show that PE-backed IPOs outperform their non-PE-backed counterparts. We furthermore find that the underlying determinants of stock performance that seem to affect PE-backed companies are retained share, holding period and valuation levels at the time of IPO. Evidence also points toward that PE-backed companies taken public in a high-volume IPO environment tend to actually overperform and that a small fund size positively affects stock performance on the short-term.

1.1. Purpose

This paper adds substance to current research in the field by analysing the Nordic market. To the best of our knowledge, no similar research on the Nordic region has been published in well-known journals. Furthermore, previous studies have to a large extent focused on performance differences between PE-backed and non-PE-backed IPOs, but to a large extent ignored to do a thorough analysis of what aspects of private equity firms and their portfolio companies that cause the difference (e.g. Schöber 2008; Levis 2011). Levis (2011) explicitly state that his result “raise the fundamental question regarding the underlying sources of performance”. This study consequently provides empirical evidence of the underlying determinants of stock price performance of PE-backed IPOs.

1.2. Research questions

In order to compare our findings with previous studies and provide a solid base for all other hypotheses, we begin to compare the stock performance of the two sub-groups: PE-backed IPOs and non-PE-backed IPOs:

Do PE-backed IPOs overperform non-PE-backed IPOs?

Next, we progress to answer the following questions relating to the underlying reasons for PE-backed IPOs stock performance:

Does a larger access to capital of the backing private equity fund have a positive effect on stock performance?

Does a higher retained ownership by the private equity firm in the portfolio company at the time of IPO have a positive effect on stock performance?

Does a longer holding period of the portfolio company have a positive effect on stock performance?

Do PE-backed companies that are taken public in a high-valuation environment show inferior aftermarket performance?

Do PE-backed companies that are taken public in a market with high IPO volume show inferior aftermarket performance?

1.3. Definitions and delimitations

The below definitions are used in the thesis:

- i. **Assets under Management (AuM):** Refers to the monetary amount of all funds raised across time.

- ii. **Buyout backed company:** A company owned specifically by a buyout fund, normally taking a significant ownership stake and financing a major part of the acquisition using leverage (Kaplan & Strömberg, 2009).
- iii. **Fund size:** In this thesis, refers to the monetary amount of a specific fund raised.
- iv. **Holding period:** In this thesis, refers to time between investment and IPO, if not stated otherwise.
- v. **Limited Partners (LPs):** The people or institutions that have invested in the private equity fund, i.e. the ones that provide the capital for the private equity professionals to invest in portfolio companies.
- vi. **Nordics:** In this thesis, refers to Sweden, Denmark, Norway and Finland.
- vii. **Portfolio company:** Refers to a private equity owned company.
- viii. **Private equity:** A term used interchangeably with buyout in this study.
- ix. **Quick flip:** In this thesis, when a company is taken public within a year it was taken private.
- x. **Reverse LBO:** A public-to-private transaction made by the private equity firm in which the portfolio company is taken public once again at exit.

In order to do a thorough analysis, we limit the scope and make the below delimitations:

- i. When we measure performance, we solely analyse the stock performance. We refrain from looking at operational performance as that is a topic that deserves a thesis of its own. Consequently, when we mention performance, we are referring to stock performance unless otherwise stated.
- ii. We limit the scope of this thesis to finding the drivers of post-IPO performance of PE-backed companies. We do not examine the underlying reasons why private equity firms choose IPO as their exit path.
- iii. Since private equity investments' purchasing terms are often not disclosed, we do not include any valuation data during entry into the analysis. For the same reason we do not examine the private equity firms' return on investment.
- iv. We acknowledge that there are other types of financial sponsors than private equity such as venture capital. However, as these firms tend to invest in a very early stage as well as be characterized by a significant difference in level of operational involvement (Kaplan & Strömberg, 2009) we neither choose to group these with PE-backed companies nor to do a separate study on these, i.e. we only have companies backed by buyout firms in our sub-group of PE-backed companies.
- v. We further recognise that holding period can also be classified as time between investment and full exit, i.e. the time that the private equity firm sells the last part of its stake. For simplicity and comparability (e.g. Schöber,

2008; Levis 2011), we define holding period as the time between investment and IPO.

- vi. While many other studies have included the underpricing aspect in their private equity IPO study, we have chosen not to examine it. The reason for this is that underpricing in itself can be explained by a great many other factors which may not necessarily have anything to do with the performance on a longer-term timeframe. Instead we have chosen to do a more thorough analysis on a 1 year, 2 years and 3 years basis, starting from the last sale price on IPO day, hence leaving out the underpricing aspect.
- vii. As previously mentioned, we only analyse IPOs on the Nordic exchanges. More specifically we look at Sweden, Denmark, Norway and Finland. The reason for not including Iceland is that the IPO activity, and especially the private equity activity, in the region is negligible.

2. Previous literature

2.1. Background

2.1.1. Introduction to IPOs

The IPO market is experiencing rapid growth; on a European level €49.5Bn of proceeds were raised in 2014, a figure that have only been observed during the pre-crisis levels of 2007. The sharp rise in activity can to a large extent be accredited to the continuing low-interest rate environment putting a lot of cheap capital on the market in combination with a demand for high-return investments (PwC report, 2015). From a company point of view, an IPO is a common way to raise funds. However, by the pecking order to finance, equity is the last resort after choosing not to use internal funds or debt funding. Asymmetric information exists between current managers and shareholders, and new shareholders. Mainly because of this, issuing equity normally has a negative signalling value in the form of overvaluation or financial trouble (Myers, 1984). Moreover, Miller (1977) argues that the divergence of opinion, i.e. the different beliefs and estimates between investors, leads to an initial valuation reflecting the most optimistic views rather than the mean evaluation as long as the entire quantity for sale can be purchased by a minority of the investors considering the stock. He further claims that over time many uncertainties will be concluded, hence narrowing the divergence of opinion and lowering the market price closer to the mean valuation. As a result of the increased appetite to invest in IPOs, together with studies like Miller's, there have been significant research efforts trying to ascertain the stock underperformance of IPOs in comparison to the overall market. For instance, Ritter (1991) finds significant long-run underperformance for his sample of 1,526 U.S. IPOs taking place between 1975-1984. While several studies point towards this direction, consensus has not been reached and the research is contradicting. Rather than someone being right or wrong, this contradiction is quite natural. As Ritter (1991) mentions, his findings are for a ten-year specific time period and cannot be generalised to a definite truth that always holds. Moreover, in the aforementioned study Ritter only studies U.S. IPOs and it is reasonable to believe that results would vary across regions. Ritter et. al. (1994) conducts a comprehensive study that exhibits that the level of underperformance or overperformance varies greatly between countries. In this study, the results show that Swedish IPOs are outperforming the market. However, when looking at Finland, Hahl (2013) shows that IPOs significantly underperform the market. Research on the Nordic IPO market as a whole remains scarce.

2.1.2. IPOs in a private equity context

In the previous section, we mentioned that the pecking order to finance (Myers, 1984) indicates that equity, e.g. IPOs, as a source of funding is a negative signal about the company. However, looking through the private equity lens, the reasoning becomes vastly different as private equity firms use an IPO as an option to exit their investment and not as a source of funding (Schöber, 2008). Moreover, private equity firms do extensive due diligence before they invest and they normally place their money in mature companies with, among other things, a strong asset base and recurring revenue (Schöber 2008). Their ownership after investment is also characterised by active governance as well as the implementation of management incentives (Kaplan & Strömberg, 2009). Due to the great many differences of PE-backed companies as exemplified above, there has been reasons to believe that the stock performance of PE-backed IPOs would also differ compared to non-PE-backed IPOs. Consequently, numerous studies have been done on examining the performance of this sub-group of IPOs. Schöber's (2008) study on the U.S. market reveals that returns (unadjusted buy and hold) of PE-backed IPOs over a time frame of up to five years are positive and also statistically significant. Abnormal returns for the PE-backed IPOs are ambiguous in event time and not significant in calendar time. However, his results show that PE-backed IPOs outperform the market during the first year of trading, but that the performance worsens between approximately 8 and 32 months after the IPO. Bergström et. al. (2006) find a similar result when analyzing the London Stock Exchange and the Paris Stock Exchange; IPOs backed by private equity firms on average outperform their non-PE-backed counterparts. However, after the first 6 months of trading they underperform the market. Yet, the research is contradicting; Levis's (2011) study on the London Stock Exchange show that for the first three years post IPO, the PE-backed companies not only overperform the non-sponsored backed companies, but also the market. Worth mentioning is, however, that Levis does not look at buyout backed companies specifically, instead he groups them together with venture capital and creates another sub-group that is non-sponsor backed. While research on general IPO performance in the Nordics is limited, studies on PE-backed IPOs in the region remain even more scarce. Hence, our decision to focus on the stock performance of PE-backed IPOs in the Nordic region. Moreover, we also attempt to understand the underlying reasons for potential differences in performance within the sub-group, of which we have also seen limited analysis on.

2.1.3. "Access to capital" hypothesis

Schöber (2008) tests a hypothesis that private equity firms IPO their portfolio companies to provide better access to capital through capital markets. Unsurprisingly, his data does not support this hypothesis and it becomes evident that existing shareholders mainly turn to the equity market as a way to exit their investment.

However, the argument that access to capital may affect performance remains, but perhaps in a different way than Schöber thought. Private equity firms are generally characterized by large access to capital. They raise a fund in a separate holding company with a limited lifetime from which they can invest into companies. This provides a larger than usual pool of capital to draw from. There are two limitations to this. First, the use of capital must be in line with different covenants agreed with the LPs; one example that is often included in the agreement is the maximum amount of equity that can be injected into one portfolio company (Kaplan & Strömberg, 2009). Second, there must be money left in the fund to use. The latter raises the question whether a larger fund size would provide a better access to capital to draw from. This may enable the portfolio companies to take strategic routes they may not otherwise have been able to take under a different ownership which in turn has a positive effect on stock performance. Kaplan & Strömberg (2009) discuss how private equity firms have better access to credit markets. Similarly, Demiroglu & James (2010) show that reputable private equity firms get cheaper leverage and more flexible loan terms and covenants. While there evidently exist significant research on private equity firms access to capital, studies analysing its effect on stock performance remains scarce.

2.1.4. “Retained ownership” hypothesis

If you would own 1% or 100% in the same company, one would expect to care more about the company when owning 100%. This is of course taking it to the extreme in order to prove a point. Scholars have however, using this basic reasoning as a foundation, examined whether private equity firms’ own incentives can affect stock performance. Schöber (2008) finds that the smaller share of the company that the private equity firm retain, the more the stock is subject to underpricing. He furthermore speculates that there could be three negative signals related to the small post-IPO ownership. First, the private equity firm does not believe in the company’s further operational performance. Second, there is not a positive outlook in terms of stock performance on the longer-term. Third, the private equity firm will put less effort into their portfolio company. While he examines the effect on underpricing as well as discusses plausible explanations for his hypothesis and result, he does not delve into how the retained share levels translate into stock performance on a longer-term. Levis (2011) does, however, study this aspect for the London Stock Exchange and finds that the stock performance is indeed positively affected by the higher retained ownership by the private equity firm.

2.1.5. “Holding period” hypothesis

If a long-term investor decides to own a company for one day or for a hundred years, chances are the company's characteristics play a key role in that decision. Once again, this is an exaggeration used to illustrate a plausible phenomenon that several scholars have tried to ascertain. Cao (2006) looks specifically at reverse LBOs. He finds that companies that are taken public shortly after they were taken private by the private equity firm tend to underperform. Schöber (2008) studies these quick flips further looking at the broader set of PE-backed companies, i.e. he does not only look at reverse LBOs. Additionally, he also adds to his hypothesis that companies that are taken public over 60 months post private equity investment will underperform. He finds highly significant results that the quick flips as well as the long-term holding periods underperform the medium-term holding periods. The results sustain regardless of looking at mean, median, BHAR or CAR. When discussing the explanations for this, Schöber thinks that during quick flips there is probably limited time for operational improvements in only a year which renders a disappointment from investors in regards to the companies' weak financial performance which becomes evident after the IPO, which in turn is reflected in the stock price. Regarding long-term holding periods, he thinks a major reason for the underperformance is that initiatives by the private equity firms have been difficult and/or unsuccessful, which subsequently become evident post-IPO and thus leading to weak stock performance.

2.1.6. “Valuation level” hypothesis

Several studies find the result that IPOs tend to go up in volume around times of favourable stock market environment (e.g. Lerner, 1994; Pagano, Panetta & Zingales, 1998; Lowry, 2003). Furthermore, Povaly (2006) examines what affects private equity firms' choice as well as timing of exit of their investment. The results show that the state of capital markets is an important factor in both the choice and timing of the exit. However, he also finds that the factor that affects the timing aspect most is the operating performance of the portfolio company. The former leads one to believe that private equity firms could potentially have more flexibility in terms of when they choose to IPO their portfolio companies. Of course, we are open to apply Schultz's (2003) alternative reasoning on PE-backed IPOs: private equity firms are not knowingly timing their listings, but rather they tend to IPO when stock prices are rising and ex-post their IPOs seem to occur at market peaks. He further discusses that this phenomenon alone, when generalised for the entire IPO market, can explain IPO underperformance. Moreover, Schöber (2008) analyses the above described effect by Schultz on PE-backed IPOs specifically. His results indicate that PE-backed companies tend to IPO during high absolute P/E ratios as well as deflated stock prices. The most pronounced relation is, however, when the change of PE ratios is the largest. Correspondingly, Cao (2011) argues that when private equity firms take companies public during high valuations it

subsequently tends to lead to underperformance. While Cao's analysis mainly revolves around operational and financial underperformance, it is implicit that this should also be reflected in the stock performance.

2.1.7. "IPO volume" hypothesis

When it comes to how IPO volume in the overall market affects stock performance of IPOs, several studies show that companies taken public in times of high IPO activity tend to underperform significantly compared to their counterparts that IPO in an environment with low activity (e.g. Ritter, 1991; Loughran & Ritter, 1995; Brav et. al., 1997). While Schöber (2008) does not analyse the market valuation environment effect on performance as described in the previous section, he does examine the aftermarket performance effect of timing of IPOs in regard to overall IPO volume in the market. He does his tests on a quarterly level, analysing Q1 1990-Q4 2001 and categorising each quarter's IPO activity. He finds that when PE-backed companies IPO during high-volume times, they underperform the market, and vice versa.

2.2. Hypothesis development

To test whether PE-backed IPOs outperform non-PE-backed IPOs is the core of our paper, which will in turn enable comparison with existing studies. In addition, it will provide a solid base for our other hypotheses. Therefore, our first hypothesis is intended to determine if PE-backed IPOs outperform their non-PE-backed counterparts. After that, we continue with our five other hypotheses regarding what drives performance in PE-backed IPOs.

2.2.1. Difference in performance between PE-backed and non-PE-backed IPOs

Looking at previous research as described in section 2.1.2., although no consensus has been reached, a major part of the previous literature suggests PE-backed companies' IPO performance exceeds their non-PE-backed counterparts. Therefore, our first hypothesis is:

H₁: PE-backed IPOs perform better than non-PE-backed IPOs

2.2.2. "Access to capital" hypothesis

According to the previous research, as presented in section 2.1.3., different studies about how private equity firms have better access to capital exist, in one form or the other. However, limited research has been done on testing if this advantage influences stock performance. It is plausible that when having a better access to capital the private equity firm can enable their portfolio company to make strategic, or even transformational, choices that otherwise could not have been implemented. For this

reason, we hypothesise that private equity firms' most fundamental access to capital – their fund size – benefits their performance:

H₂: A larger fund size has a positive effect on stock performance

2.2.3. “Retained ownership” hypothesis

Referring to the research in section 2.1.4., studies on other markets find that a higher retained ownership by the private equity firm post-IPO benefits aftermarket performance. As previous scholars have discussed, it is reasonable to believe that private equity firms have larger incentives to retain a higher ownership in a company with good future prospect and/or put in more effort in monitoring the company as their stakes are higher which subsequently will affect performance. We thus hypothesise the following:

H₃: A larger retained share by the private equity firm at the time of IPO has a positive effect on stock performance

2.2.4. “Holding period” hypothesis

Previous studies, as presented in section 2.1.5., made on the private equity firms' holding period of their portfolio companies suggest that a short holding period has a negative effect on stock performance since small improvements can be made in such a limited time frame which would eventually be reflected in the share price. For the same reason, performance is likely to go up the longer the holding period. Our fourth hypothesis is therefore:

H₄: A longer holding period has a positive effect on stock performance

2.2.5. “Valuation level” hypothesis

While we will do a high-level analysis on our sample of the valuation timing of PE-backed IPOs, our main concern is how the valuation levels at IPO may affect aftermarket performance of PE-backed IPOs, regardless if private equity firms have a market timing ability or not as this is not within our scope. According to research in section 2.1.6, high market valuations alone could explain underperformance, which also makes intuitive sense that these companies have a higher risk of being overvalued and furthermore adjust down in line with the overall market. Our fifth hypothesis is hence the following:

H₅: PE-backed companies that are taken public in times of low valuations perform better than those that are taken public in times of high valuations

2.2.6. “IPO volume” hypothesis

Studies, as presented in section 2.1.7 show that stock performance tend to be worse in times with high IPO activity, both for IPOs in general as well as PE-backed companies specifically. We therefore also ask the question to see if this holds on the Nordic market:

H₆: A higher IPO volume in the overall market has a negative performance effect on PE-backed IPOs

3. Data and methodology

3.1. Data

3.1.1. Data collection process

The data gathered comprises 309 IPOs taking place between January 2001 and May 2016 on the Nordic exchanges. As previously mentioned, we are not including Iceland since the IPO activity as well as the private equity activity is negligible. The IPOs were thereafter divided into two sub-groups: PE-backed IPOs and non-PE-backed IPOs. For all IPOs, the following was gathered: share price up to 3 years after listing, market capitalisation, industry classification, IPO date, stock exchange and first day of trading. In addition, the following was gathered for the PE-backed companies: investment year, fund size and total shares outstanding. For the market related data, the MSCI index for each Nordic country was pulled as well as P/E ratios for the OMX Nordic All-Share index.

3.1.2. Initial sample generation

As a first step, we gathered a gross list of Nordic IPOs from January 2001 to May 2016 from the SDC database. We used May 2016 as cut-off date in order to be able to do the stock performance analysis up to three years forward. We thus got 379 Nordic IPOs taking place between the above dates. Thereafter, the following companies were excluded:

- i. IPOs on non-Nordic exchanges (which could not be filtered away in SDC)
- ii. IPOs on Aktietorget

This left us with 340 IPOs. The reason for ii. was because these companies are very small and at an entirely different stage in their business cycle which private equity investors very rarely would IPO in.

Next, we divided the list of IPOs into two sub-group based on their ownership before being taken public: PE-backed and non-PE-backed. While SDC did such a grouping on its own, we did not know exactly how their private equity classification was done. Therefore, we manually classified all IPOs by going through websites, Mergermarket and IPO prospectuses. The latter was gathered from FI's website.

3.1.3. Classification of IPOs

Our starting point for our private equity classification was Schöber's (2008) definition that the backing private equity firm(s) should have a minimum ownership of ten percent in total. This was checked through company websites and Mergermarket. The other criteria that also had to be fulfilled was that the company should be backed by a buyout

fund. To make sure we used the definition of buyout fund correctly and consistently we cross-referenced our list with Swedish Private Equity & Venture Capital Association (SVCA), which provides a long-list of all buyout firms active in the Nordic region. Worth mentioning is that SVCA's list also includes international private equity funds that are not headquartered in the Nordics. Although the private equity ownership also becomes clear when doing a manual search in Mergermarket, the SVCA list ensures we have not missed to categorise any companies as PE-backed. This *modus operandi* entails that we purposely exclude venture capital backed companies in this sub-group and classified 58 of the IPOs as PE-backed.

3.1.4. Collection of company specific data

For the equity market data, we used CapitalIQ and FactSet to gather: share price data, market capitalization at IPO and first day of trading. Share prices were pulled for all trading days up to three years after IPO (unless delisted or bankrupt). While we only needed share prices on a monthly basis for calculating CAR, we still pulled share prices for all trading days in order to capture potential delistings or bankruptcies. Out of our set of 340 companies, 31 were missing share price data, leaving us with a total of 309 IPOs. There was no missing share price data on any of the PE-backed IPOs, i.e. the number of PE-backed IPOs remained 58. For this reason, it was highly beneficial to cross-check the companies and their associated data with both CapitalIQ and FactSet. Furthermore, SDC provided us with associated information regarding industry classification and shares issued at IPO for our set of companies. We also collected data for MSCI Sweden, MSCI Norway, MSCI Denmark and MSCI Finland from FactSet in order to calculate the market returns. Moreover, we gathered P/E ratios for the Nordic All-share index across our entire sample period in order to do the "valuation level" hypothesis. For the private equity specific data, we first used CapitalIQ and FactSet to get total shares outstanding at IPO in order to be able to calculate retained share. Last, investment year and fund size were manually gathered from company websites and Mergermarket to test our hypotheses relating to holding period and access to capital. From this final manual gathering, there find sizes were missing for only five companies and entry year was missing for only one company.

3.1.5. Data criticism

The cross-checking of CapitalIQ and FactSet data entails robustness. However, for some of the older IPOs one of the two databases did not have the data, in which case we simply went with the one database that did have the data. This creates some risk that data for these companies are not accurate since we did not have anything to cross-check it with. Though, we deem this risk to be small as stock prices never differed for all the companies that we had access to from both databases. Furthermore, the accuracy of our results may be negatively affected by the missing data described in the previous section.

However, as this corresponded to less than 10% of the IPOs this should have a very limited impact on our overall results. In addition, we have no reason to believe that there was a bias towards which companies that were missing data and our results should therefore not be skewed. Furthermore, the retained ownership stake that we have calculated is the retained ownership by all previous owners of the company. I.e., if there are owners beyond the backing private equity firm(s), these ownerships could also be reflected in the retained share figure. While we recognise that this might be an imprecise representation of the true ownership retained by the buyout firm(s), a better level of granularity across the entire sample cannot be accessed through public sources, which is why we have used the aforementioned as a suitable proxy.

3.2. Methodology

3.2.1. Considerations

Performing an analysis of aftermarket stock performance of PE-backed IPOs compared to non-PE-backed IPOs requires the following to be used, defined and explained: performance measurements, benchmarking, time regimes, and test statistics. Below follow descriptions for the methods used in the analysis for this paper.

3.2.2. Performance measurements

Measuring the performance of an IPO can be done with the help of several different metrics. Several influential papers on this topic, such as Schöber (2008), Bergström et al. (2006) and Ritter (1991), use two specific metrics that have become more of a standard when analysing the long-term performance of an IPO as well as long-run performance in general. The two metrics are cumulative abnormal returns (CARs) and buy-and-hold abnormal returns (BHARs). While measuring long-term stock performance is a topic that has been covered by several papers and authors, as described in section 2, there are still no generally accepted methods on what metrics to use (Schöber, 2008). Further, it is also unclear on which test statistics are most suitable to use when analysing the abnormal returns, which is a topic that we will discuss in section 3.2.5.

For this paper, we have decided to use both the CAR method as well as the BHAR method when analysing the stock performance of IPOs. The purpose for choosing both the methods is that it enables for a full comparison with other papers on the same topic. Below follow two sections that detail the two metrics and the mathematics behind them.

Cumulative abnormal return (CAR)

When using the cumulative abnormal returns method, the abnormal returns for a company are summed up for a given period. The abnormal return in the CAR method is defined as the return for a company during a given time-period, subtracted with the

return for a benchmark for the corresponding time-period. As Barber and Lyon (1997) note, the most used time-periods used in research that analyses abnormal returns is either to use daily or monthly abnormal returns. To follow the previous research on this topic cited in this paper, we will use monthly abnormal returns. Thus, the CAR for a company, given a specific month, is the monthly return for a stock subtracted by the monthly return for a benchmark. The mathematical expression for CAR is:

$$CAR_i^{1,T} = \sum_{t=1}^T (R_i^t - R_B^t),$$

Where $CAR_i^{1,T}$ is the cumulative abnormal return for company i for month 1 through T , R_i^t is the return for company i for month t and R_B^t is the return for the benchmark B for month t used for company i . Thus, the expression $R_i^t - R_B^t$ represents the abnormal return for company i for month t .

The CAR for a portfolio of companies adds an additional component of complexity. The portfolio CAR depends on partly the CARs of each individual portfolio company, and partly on a weighting mechanism, as described further below, and can thus be expressed as:

$$CAR_p^{1,T} = \sum_{i=1}^n w_i \times CAR_i^{1,T}$$

Where $CAR_p^{1,T}$ is the cumulative abnormal return for portfolio p consisting of n companies for month 1 through T , w_i is the weighting used for company i and $CAR_i^{1,T}$ is the cumulative abnormal return for company i for month 1 through T .

Buy-and-hold abnormal return (BHAR)

The buy-and-hold abnormal returns are a better representation of the return an investor would experience, since abnormal returns are compounded over a given period as opposed to being cumulated as in the calculation of CAR. Abnormal returns in the BHAR method of analysing stock performance for a company are defined as the compounded return for the company over a given time-period, subtracted by the compounded return for the benchmark for the corresponding time-period. Analogous to arguments in the CAR section, we will be using monthly abnormal returns in this paper when calculating BHAR. The BHAR over a given period can be expressed as:

$$BHAR_i^{1,T} = \prod_{t=1}^T (1 + R_i^t) - \prod_{t=1}^T (1 + R_B^t)$$

Where $BHAR_i^{1,T}$ is the buy-and-hold abnormal return for company i for month 1 through T , R_i^t is the return for company i for month t and R_B^t is the return for the benchmark B for month t . Thus, the expression $\prod_{t=1}^T (1 + R_i^t)$ represents the

compounded stock performance rate for company i for month 1 through T and $\prod_{t=1}^T (1 + R_B^t)$ represents the compounded stock performance rate for the benchmark used for company i for month 1 through T .

Similar to the CAR of a portfolio of companies, the BHAR for a portfolio p of n companies is:

$$\text{BHAR}_p^{1,T} = \sum_{i=1}^n w_i \times \text{BHAR}_i^{1,T}$$

Where $\text{BHAR}_p^{1,T}$ is the buy-and-hold abnormal return for portfolio p consisting of n companies for month 1 through T , w_i is the weighting used for company i and $\text{BHAR}_i^{1,T}$ is the buy-and-hold abnormal return for company i for month 1 through T .

Weighting scheme

When calculating CAR and BHAR for a portfolio of companies, the individual CARs and BHARs for the respective companies can be weighted either on an equal-weighted basis or on a value-weighted basis.

If using an equal-weighted (EW) basis, the CAR and BHAR for a portfolio p consisting of n companies are:

$$\begin{aligned} \text{CAR}_{p,EW}^{1,T} &= \sum_{i=1}^n \frac{1}{n} \times \text{CAR}_i^{1,T} \\ \text{BHAR}_{p,EW}^{1,T} &= \sum_{i=1}^n \frac{1}{n} \times \text{BHAR}_i^{1,T} \end{aligned}$$

If the abnormal return metric for the portfolio is calculated using value-weighted approach, it must be decided upon what value-metric to use, such as e.g., market capitalization or assets. In this paper, we will be using market capitalization at the time of IPO, which is line with previous research on the topic (e.g., Schöber, 2008; Bergström et.al., 2006). If mc_i is the market capitalization for company i and mc_p is market capitalization of the portfolio p consisting of n companies, such that $mc_p = \sum_{i=1}^n mc_i$, then the value-weighted (VW) CAR and BHAR for portfolio p is:

$$\begin{aligned} \text{CAR}_{p,VW}^{1,T} &= \sum_{i=1}^n \frac{mc_i}{mc_p} \times \text{CAR}_i^{1,T} \\ \text{BHAR}_{p,VW}^{1,T} &= \sum_{i=1}^n \frac{mc_i}{mc_p} \times \text{BHAR}_i^{1,T} \end{aligned}$$

Equal-weighted abnormal returns enable one to measure potential differences in management abilities, as it gives equal weights to all companies in a portfolio and hence disregarding size effects (Bergström et. al., 2006). However, Fama (1998) raises the

issue that smaller companies experience “anomalies” to a larger extent than larger companies which might render more “extreme” results. When using value-weighted abnormal return, one controls for potential size-effects. However, very large companies might dominate the results. In line with the previous literature, we will be using both the equal-weighted as well as the value-weighted abnormal returns throughout this paper.

Acquisitions, delisting and bankruptcy

A portion of the companies in our sample have either been acquired, delisted or went bankrupt during their first three years of public trading. We have chosen to truncate the abnormal returns for companies that either have been acquired or delisted, which is in keeping with previous research. Thus, for all the periods following the acquisition or delisting, the abnormal returns are flat, irrespective of the future benchmark performance. For companies that went bankrupt, all abnormal returns following the day of bankruptcy, the abnormal returns are -100%. The reason for continued inclusion of companies that either have been acquired, delisted or went bankrupt is to avoid survivorship bias in our abnormal returns.

3.2.3. Benchmarking

Measuring the performance of an IPO or a portfolio of IPOs – and also more generally of a stock or a portfolio of stocks – without taking into consideration how the overall market has been performing in the corresponding time-period can be interesting as it reflects what an investor would earn if he decides to hold the security. However, in academic research on IPO performance the norm is to compare the performance of IPOs with the performance of the overall market using an index or any other portfolio of companies that might act as a suitable benchmark. By doing this, one captures any over- or underperformance (Schöber, 2008).

A benchmark can take on of two forms. It can be a broad equity market index such as S&P 500. Also, it can be a specific company or a portfolio of companies that match the IPO in question with regards to relevant characteristics such as, size and industry (Schöber, 2008). Either way, a benchmark should ideally share the primary characteristics and risk profile that are associated with the IPO or the portfolio of IPOs (Bergström et.al., 2006). We will follow Bergström et.al. (2006) and only use indices as benchmarks as that is advantageous from an investor perspective. The indices used in our analysis are MSCI Sweden, MSCI Denmark, MSCI Finland and MSCI Norway, depending on the country of listing for each of the companies.

Further, we will not be adjusting our indices by excluding the IPOs in the sample, even though that could potentially lead to making the abnormal returns retrieved to be biased. This is motivated by Barber & Lyon (1997) as well as Brav et.al. (1999) who argue that such an adjustment has little impact on the results.

3.2.4. Time regimes

Schöber (2008) explains that there are two different approaches to time regimes that are used when analysing long-term performance of IPOs: event time analysis and calendar time analysis.

Doing the analysis in event time is the most used in research when evaluating long-term performance of IPOs (Schöber, 2008). This means that returns are calculated relative to the IPO date, and that IPOs across time are analysed by grouping together abnormal returns for different periods, depending on the relative position to the IPO date, i.e., the first-month abnormal return for an IPO in January 2002 and first-month abnormal return for an IPO in December 2007 are grouped together.

Analysing abnormal returns for different periods in calendar time, however, does not take into consideration the relative position to the IPO date, but rather as they happen, i.e., in *calendar time*. Several papers on the topic highly advocate the use of calendar time regimes. Fama (1998) argues that the calendar time approach solves the issue of not capturing cross-correlations that may be present when using the event time approach. This is further agreed on by other scholars, such as Mitchell & Stafford (2000) and Gompers & Lerner (2003). However, for greater comparability with previous research, we have chosen to focus on event-time analysis in this paper.

To illustrate the use of event-time analysis, consider the following price performances for three companies that are taken public in the end of year 2x01, 2x02 and 2x03, respectively as well as for a benchmark.

Table 1. Performance for Company I, Company II, Company III and benchmark

	2x01	2x02	2x03	2x04	2x05	2x06
Company I	n/a	10.0%	7.0%	-2.0%		
Company II		n/a	10.0%	5.0%	8.0%	
Company III			n/a	10.0%	-5.0%	-1.0%
Market	n/a	2.0%	1.0%	-2.0%	1.0%	-1.0%

Note: Company I, Company II and Company III are taken public in the end of 2x01, 2x02 and 2x03, respectively.

The abnormal returns using the equal-weighted CAR method in event time are shown in Table 2.

Table 2. Abnormal returns and equal-weighted CAR in event time

	Year 1	Year 2	Year 3
Company I	8.0%	6.0%	0.0%
Company II	9.0%	7.0%	7.0%
Company III	12.0%	-6.0%	0.0%
EW AR	9.7%	2.3%	2.3%
CAR (EW)	14.3%		

3.2.5. Test statistics

Throughout the remainder of the paper we have performed various tests to investigate whether the results are statistically significant. When analysing CARs and BHARs in testing whether the medians differ from zero, we have performed Wilcoxon Signed Rank Test. The reason for using Wilcoxon Signed Rank Test is that CARs and BHARs can produce extreme outliers – since returns are either summed or compounded – making the distributions of abnormal returns to be non-normal, making non-parametric tests preferable. Barber & Lyon (1996) highlight that the Wilcoxon Signed Rank Test is superior in cases when outliers are present. Analogously, we will apply the Mann-Whitney U Test when comparing the abnormal returns for PE-backed IPOs with non-PE-backed IPOs. The use of test statistics is in line with previous research on the topic (e.g., Schöber, 2008; Barber & Lyon, 1997; Cao & Lerner, 2009).

In order to examine to what extent different factors, as discussed in section 2.2, have on the performance of PE-backed IPOs, we will be using another non-parametric test, the Kruskal-Wallis Test, to check whether the different groups originate from the same distribution, taking inspiration from Schöber (2008).

4. Results

4.1. Descriptive statistics

The sample's IPOs distributed on year of IPO and country is illustrated in Table 3 and Table 4.

Table 3. Distribution of IPOs based on year of IPO

	Number of IPOs			Average market cap, USDm		
	Total	PE-backed	Non-PE-backed	Total	PE-backed	Non-PE-backed
2001	10 (3%)	0 (0%)	10 (4%)	1,884	n/a	1,884
2002	6 (2%)	4 (7%)	2 (1%)	238	342	31
2003	3 (1%)	0 (0%)	3 (1%)	11	n/a	11
2004	11 (4%)	0 (0%)	11 (4%)	562	n/a	562
2005	33 (11%)	7 (12%)	26 (10%)	432	217	490
2006	49 (16%)	7 (12%)	42 (17%)	254	564	203
2007	43 (14%)	6 (10%)	37 (15%)	206	617	139
2008	11 (4%)	0 (0%)	11 (4%)	44	n/a	44
2009	1 (0%)	0 (0%)	1 (0%)	87	n/a	87
2010	18 (6%)	4 (7%)	14 (6%)	947	2,038	636
2011	13 (4%)	2 (3%)	11 (4%)	229	160	241
2012	4 (1%)	0 (0%)	4 (2%)	288	n/a	288
2013	15 (5%)	2 (3%)	13 (5%)	335	915	246
2014	33 (11%)	9 (16%)	24 (10%)	621	1,449	310
2015	49 (16%)	14 (24%)	35 (14%)	355	678	225
2016	10 (3%)	3 (5%)	7 (3%)	487	710	391
Total	309	58 (19%)	251 (81%)	426	784	343

Note: The percentages in the year-section to refer to each year's respective share of total IPOs. The percentages in the sum-section refer to each group's respective share of total IPOs.

It is interesting to note that in the years leading up to the financial crisis, the IPO volume increased for both private equity-backed IPOs and non-private equity backed IPOs. The same holds for the years 2014-2015. Those two periods alone constitute more than half of the total number of IPOs. Further, PE-backed IPOs are on average more than twice as large as non-PE-backed IPOs.

Table 4. Distribution of IPOs based on country

	Number of IPOs			Average market cap, USDm		
	Total	PE-backed	Non-PE-backed	Total	PE-backed	Non-PE-backed
Denmark	38 (12%)	5 (9%)	33 (13%)	652	3,217	263
Finland	29 (9%)	5 (9%)	24 (10%)	326	186	356
Norway	121 (39%)	13 (22%)	108 (43%)	468	561	457
Sweden	121 (39%)	35 (60%)	86 (34%)	336	606	227
Total	309	58 (19%)	251 (81%)	426	784	343

Note: The percentages in the country-section refer to each country's respective share of total IPOs. The percentages in the sum-section refer to each group's respective share of total IPOs.

Regarding the distribution of IPOs across the Nordic countries, Sweden and Norway dominate for all IPOs with almost 80% of the IPOs being taken public in the two countries. Further, 60% of the PE-backed companies are taken public on a Swedish stock exchange.

Several companies in our sample have been either been acquired, delisted or went bankrupt in the first three years of trading. The distribution of the companies' status of listing is presented below.

Table 5. Surviving companies

	Surviving companies	Acquired /delisted	Bankrupt
Year 1	303 (98%)	5 (2%)	1 (0%)
Year 2	288 (93%)	19 (6%)	2 (1%)
Year 3	272 (88%)	31 (10%)	6 (2%)

In our analysis under section 4.3 we will be referring to low, medium and high levels of various factors that might influence aftermarket performance of PE-backed IPOs. The definition of low level is values below the 25th percentile, high level is above the 75th percentile and medium level are all other values. The distributions of the five variables analysed under section 4.3 are presented in Table 6.

Table 6. Distribution of variables used in hypotheses testing

	IPO volume	Valuation	Retained share (PE)	Holding period (PE)	Fund size (PE)
Min	1	9.0x	11.0%	1	43.6
Q1	9	18.6x	42.6%	3	290.0
Q2	12	20.8x	52.8%	5	765.1
Q3	33	23.4x	66.7%	8	2,946.2
Max	49	33.3x	87.4%	14	10,700.0
Mean	19	21.0x	54.5%	5	1,857.4

Note: For retained share, holding period and fund size, the numbers presented are based on the distribution among PE-firms. For all the other variables, the distributions are based on the whole sample

Table 7 presents the distribution of PE-backed IPOs based on the definitions of low, medium and high levels explained above.

Table 7. Distribution of variables among PE companies

	IPO volume	Valuation	Retained share	Holding period	Fund size
Low	4(7%)	13(22%)	15(26%)	8(14%)	13(25%)
Medium	18 (31%)	29 (50%)	28 (48%)	41 (72%)	27(51%)
High	36 (62%)	16 (28%)	15 (26%)	8 (14%)	13 (25%)
Total	58	58	58	57	53

4.2. Aftermarket performance and its determinants

4.2.1. Difference in performance between PE-backed and non-PE-backed IPOs

The aftermarket performance of PE-backed IPOs and non-PE-backed IPOs is ambiguous. The results from analysing abnormal returns differ depending on which abnormal return metric is used as well as which time-period is considered. The results for CAR and BHAR for the time-periods 12 months, 24 months and 36 months are presented in Table 8 and Table 9.

Table 8. Cumulative Abnormal Returns for PE-backed IPOs and non-PE-backed IPOs for 12, 24 and 36 months

	All			PE			Non-PE		
	EW	VW	Median	EW	VW	Median	EW	VW	Median
12	5.3%	4.9%	3.0% (0.32)	8.5%	(7.9%)	13.2%** (0.03)	4.6%	11.6%	1.0% (0.87)
24	1.9%	5.0%	1.1% (0.71)	10.2%	4.2%	10.7% (0.14)	(0.0%)	7.2%	-4.5% (0.34)
36	29.4%	11.3%	2.4% (0.97)	9.1%	12.4%	17.1% (0.12)	34.0%	10.7%	-2.9% (0.55)

Note: Number in brackets denote the p-value from a two-sided Wilcoxon Signed Rank Test that the median does not differ from zero. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

Table 9. Buy-and-Hold Abnormal Returns for PE-backed IPOs and non-PE-backed IPOs for 12, 24 and 36 months

	All			PE			Non-PE		
	EW	VW	Median	EW	VW	Median	EW	VW	Median
12	8.8%	9.7%	0.8% (0.67)	12.6%	-0.8%	7.8%** (0.04)	8.0%	15.2%	-1.5% (0.69)
24	9.4%	11.5%	-9.2% (0.36)	23.5%	2.0%	0.4% (0.45)	6.1%	16.4%	-13.5% (0.23)
36	10.3%	15.2%	-13.3% (0.13)	15.2%	5.4%	4.3% (0.41)	9.1%	20.4%	-20.6%* (0.08)

Note: Number in brackets denote the p-value from a two-sided Wilcoxon Signed Rank Test that the median does not differ from zero. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

While the results are not significant for all the time frames, we find that looking at both median BHAR and CAR, PE-backed companies outperform the market on a more short-term basis (on a 5% significance level). This outcome is broadly in line with Schöber (2008) that finds statistically significant results that the performance is positive in the first year for the same metrics. However, even though all the median PE-backed abnormal returns are positive, no definitive conclusions can be made about longer time-frames from the above results regarding PE-backed IPOs. However, it should be noted that the p-values for 24 and 36 months CAR are 0.14 and 0.12, respectively. Regarding non-PE-backed IPOs, we only have a 10% significance on a -20.6% three-year BHAR. For the total sample of IPOs, we have no conclusive evidence that the median abnormal returns deviate from zero. However, the median three-year BHAR for the whole sample is -13.3% with a p-value of 0.13, pointing towards an overall underperformance which is in line with influential previous studies such as Ritter (1991) and Levis (2011).

Furthermore, the same ambiguousness holds when comparing PE-backed IPOs' aftermarket performance with non-PE-backed IPOs. The results from comparing the

two groups of IPOs by using a Mann-Whitney U Test that the abnormal returns have the same distribution.

Table 10. Mann Whitney U Test for differences in abnormal returns between PE-backed IPOs and non-PE-backed IPOs

	CAR			BHAR		
	12 months	24 months	36 months	12 months	24 months	36 months
PE	13.2%*	10.7%	17.1%	7.8%*	0.4%	4.3%*
Non-PE	1.0%*	-4.5%	-2.9%	-1.5%*	-13.5%	-20.6%*
Z	-1.626	-1.310	-1.049	-1.810	-1.573	-1.759
p-value	0.10	0.19	0.29	0.07	0.12	0.08

Note: Median CAR and BHAR values for PE-backed and non-PE-backed IPOs are displayed. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

Table 10 shows that the results for both one-year CAR and BHAR are statistically significant at 10%, indicating that in the shorter-term PE-backed IPOs outperform compared to their non-PE-backed counterparts. Combining the results in Table 10 with the results from Table 8 and 9, PE-backed IPOs seem to outperform both the market as well as non-PE-backed IPOs. These results are in line with Levis (2011) and Bergström et. al. (2006). Looking at longer-term horizons, we only find a 10% significance for the three-year BHAR, with the three-year CAR being statistically insignificant (p-value of 0.29), entailing that no definitive conclusions can be drawn. This contradicts existing research, such as Bergström et. al. (2006), who show that PE-backed IPOs outperform non-PE-backed IPOs across all timeframes.

Having now showed the results regarding differences in performance, the next sections shows some of the underlying aspects that may determine aftermarket performance of PE-backed IPOs.

4.2.2. “Access to capital” hypothesis

To test for the hypothesis that different levels of access to capital for PE-backed IPOs render performance differences, we divide the fund sizes into levels of Low, Medium or High. We were able to find fund size information on 53 PE-backed IPOs out of 58 total PE-backed IPOs. The results are shown below in Table 11.

Table 11. Equal-weighted abnormal returns for PE-backed IPOs based on level of fund size

	CAR			BHAR		
	12 months	24 months	36 months	12 months	24 months	36 months
Low	31.6%	28.2%	14.3%	47.3%*	86.4%	39.3%
Medium	-2.7%	2.8%	7.6%	-3.3%*	-0.5%	6.3%
High	5.0%	-0.3%	4.3%	8.4% *	9.6%	13.4%
p-values	0.13	0.43	0.80	0.10	0.35	0.78

Note: p-values are derived from a two-sided Kruskal-Wallis Test that the groups' means are the same. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

Based on the results there is no evidence to suggest that the level of fund size (that acquired the respective company) has any impact on long-term stock performance. The 12 months BHAR however shows significance at a 10% level, indicating that there might be a shorter-term impact on the stock performance. This is further strengthened when comparing Low levels of fund size to Medium/High levels, which shows a significance at a 5% and 10% level for the 12 months BHAR and 12 months CAR, respectively (see Appendix 1) and indicates that smaller sized PE-funds outperform larger sized PE-funds in the shorter-term. While there, to the best of our knowledge, has not been anyone performing a similar test in well-known journals, the results are very interesting when comparing to previous literature on adjacent topics. Kaplan & Strömberg (2009) and Demiroglu & James (2010) who discuss that private equity firms have better access to capital, primarily through different dynamics in the credit market, was a main rationale for our hypothesis that better access to capital through fund size would increase stock returns. Since our results show the contrary, one plausible explanation is that smaller funds have smaller incentives to quickly deploy their capital and hence on average invest in superior companies, which is subsequently reflected in the stock performance. One may reason that the bigger a fund gets, the more it becomes a management fee game which in turn results in poor performance.

4.2.3. “Retained ownership” hypothesis

Retained ownership by the PE firm has previously been shown to have a positive impact on the long-term performance of PE-backed IPOs (Levis, 2011). We investigate whether that is the case on Nordic PE-backed IPOs as well by characterising levels of retained ownership at the time of IPO and calculate the abnormal returns, for both CAR and BHAR. The results for the Nordic PE-backed IPOs are shown in Table 12.

Table 12. Equal-weighted abnormal returns for PE-backed IPOs based on the PE funds retained ownership at the time of IPO

	CAR			BHAR		
	12 months	24 months	36 months	12 months	24 months	36 months
Low	-20.7%*	-17.4%	-31.4%*	-18.0%***	-16.7%***	-27.2%***
Medium	17.1%*	19.7%	24.1%*	17.5%***	18.8%***	20.9%***
High	21.5%*	20.2%	21.5%*	33.9%***	72.6%***	46.9%***
p-values	0.07	0.14	0.06	0.00	0.01	0.00

Note: p-values are derived from a two-sided Kruskal-Wallis Test that the groups' means are the same. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

The above results strongly indicate that there is a difference between the performance of PE-backed IPOs based on the retained ownership by the PE funds at the time of IPO. The 12 months and the 36 months CAR show a significance at a 10% level, and the BHAR for all time-periods have a significance at a 1% level. It is interesting that the performance differences pertain even in the longer-term and not only in the shorter-term, as it is most likely that the PE funds over time partially exit their investments and eventually exit in whole. However, building upon the discussion that Schöber (2008) had on retained ownerships of PE funds and the impact it has on underpricing, the high levels of retained ownership might send credible signals about what the fund thinks about the state of the company to the market which in turn might impact the performance in the longer-term as well. Further, a higher retained ownership by the PE fund might be signal to the market that the fund believes that the company will perform well on the market to the extent that it yields a return that is at least above the hurdle rate for carried interest for the fund (which is very favourable for the fund and its carried interest shareholders). If the market perceives this signal and finds it credible, it could further explain the longer-term overperformance.

When combining the Low-level and Medium-level groups and comparing them against the High-level group, the results are somewhat inconsistent with the results in Table 12. There is some evidence that a High level of retained ownership leads to better performance for PE-backed IPOs. The BHAR for 12 months and 36 months remain significant at a 1% level, and BHAR for 24 months is significant at a 5% level. However, the CAR for all time-periods are insignificant at even a 10% level (see Appendix 2). Nonetheless, there is still some evidence that there might be a positive effect resulting from a higher level of retained ownership.

When comparing Low levels of retained ownership with Medium/High levels, the results are more consistent (see Appendix 3), showing evidence of stronger performance for PE-backed IPOs where the PE-funds' remain a relatively higher level of retained ownership across all time-period, measuring abnormal returns with both CAR

(significant at a 5% level for both 12 and 36 months and at a 10% level for 24 months) and BHAR (1% significance for all time-periods).

4.2.4. “Holding period” hypothesis

Schöber (2008) shows that PE-backed IPOs that go public shortly (less than one year) or very long (more than 5 years) after the PE funds initial investment, perform worse than those PE-backed companies that went public within one to five years. We have in our analysis chosen to categorize the holding periods differently than Schöber (2008), in consistency with the methodology used for testing the other hypotheses. The results for test are shown in Table 13.

Table 13. Equal-weighted abnormal returns for PE-backed IPOs based on PE funds’ holding period level before IPO

	CAR			BHAR		
	12 months	24 months	36 months	12 months	24 months	36 months
Low	-7.2%	12.8%	19.0%	-3.7%	-0.8%	11.4%
Medium	9.1%	5.5%	0.6%	14.6%	22.3%	11.4%
High	23.4%	30.9%	37.3%	20.9%	28.5%	39.4%
p-values	0.34	0.24	0.32	0.44	0.20	0.17

Note: p-values are derived from a two-sided Kruskal-Wallis Test that the groups’ means are the same. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

No abnormal returns for any metric and any time-period in Table 13 shows significance at even a 10% level. However, it should be noted that the Low and Medium level of holding period prior to IPO show very similar 36 months BHAR, why we choose to further refine the levels and compare Low/Medium levels with High levels of holding period, see Table 14.

Table 14. Equal-weighted abnormal returns for PE-backed IPOs based on PE funds' holding period before IPO

	CAR			BHAR		
	12 months	24 months	36 months	12 months	24 months	36 months
Low/med.	6.4%	6.7%*	3.6%	11.6%	23.1%*	11.4%*
High	23.4%	30.9%*	37.3%	20.9%	29.3%*	39.4%*
p-values	0.27	0.09	0.14	0.35	0.08	0.07

Note: p-values are derived from a two-sided Kruskal-Wallis Test that the groups' means are the same. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

According to the results in Table 14, there seems to evidence to support that a longer holding period prior to IPO results in longer-term BHAR (significance at a 10% level for both 24 months and 36 months) as well as a medium-to-long-term CAR (significant at a 10% level). These results somewhat contradict the results that Schöber (2008) received. However, they are in line with Cao & Lerner (2009) – PE-backed IPOs that went public shortly after the PE funds' initial investment perform worse compared to IPOs with a longer holding period.

4.2.5. "Valuation level" hypothesis

Research made by Schultz (2003) suggest that firms are not knowingly timing a market peak, but rather they tend to IPO when stock prices are rising and ex-post their IPOs seem to occur at market peaks. He claims that his phenomenon alone can explain IPO underperformance and as a consequence we investigate the adjacent topic of what impact the overall market valuation at the time of PE-backed IPOs has on the performance using P/E ratios from the Nordic All-Share index. The results are illustrated in Table 15.

Table 15. Equal-weighted average abnormal returns for PE-backed IPOs based on the market's average P/E multiple valuation at the time of IPO

	CAR			BHAR		
	12 months	24 months	36 months	12 months	24 months	36 months
Low	6.4%	0.9%	-4.7%	20.3%	56.2%	18.8%
Medium	6.2%	14.7%	14.7%	7.6%	14.6%	16.6%
High	14.2%	9.6%	10.2%	15.2%	13.2%	9.7%
p-values	0.58	0.12	0.13	0.56	0.16	0.16

Note: p-values are derived from a two-sided Kruskal-Wallis Test that the groups' means are the same. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

We note that there might be a difference in performance, with those IPOs that went public when the overall market P/E valuations were low, performing better than other. However, the results are insignificant. When refining the groups and combining the Medium level and High levels groups of valuation, we get results indicating that PE-backed IPOs that went public in times of low market valuations might perform better compared to other PE-backed IPOs (only two-year CAR and BHAR are significant and three-year BHAR).

Table 16. Average abnormal returns for PE-backed IPOs based on the market's average P/E multiple valuation at the time of IPO

	CAR			BHAR		
	12 months	24 months	36 months	12 months	24 months	36 months
Low	6.4%	0.9%*	-4.7%	20.3%	56.2%*	18.8%*
Med./high	9.1%	12.9%*	13.1%	10.3%	14.1%*	14.1%*
p-values	0.31	0.08	0.12	0.28	0.07	0.10

Note: p-values are derived from a two-sided Kruskal-Wallis Test that the groups' means are the same. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

The above results act as further evidence that PE-backed IPOs that are taken public in low levels of overall market valuations exhibit better performance than IPOs that taken public in times of higher market valuations, in line with the discussion by Schultz (2003).

4.2.6. "IPO volume" hypothesis

Numerous studies investigating the impact of the IPO timing with the overall IPO volume in the market find that companies that are taken public in times of high IPO activity tend to underperform significantly compared to their counterparts that IPO in an

environment with low activity (e.g. Ritter, 1991; Loughran & Ritter, 1995; Brav et. al., 1997). We have chosen to analyse whether this also holds for Nordic PE-backed IPOs and results based on different levels of IPO volume activity at the time of IPO, are presented in Table 17.

Table 17. Equal-weighted abnormal returns for PE-backed IPOs based on the overall IPO activity at the time of IPO

	CAR			BHAR		
	12 months	24 months	36 months	12 months	24 months	36 months
Low	-19.1%**	-25.4%**	-15.1%	-17.3%**	-33.5%**	-28.0%*
Medium	1.9%**	3.3%**	6.6%	14.5%**	40.8%**	16.0%*
High	14.8%**	17.7%**	13.0%	14.9%**	21.2%**	19.6%*
p-values	0.02	0.02	0.28	0.04	0.02	0.10

Note: p-values are derived from a two-sided Kruskal-Wallis Test that the groups' means are the same. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

The result seems to contradict the previous research on the topic (as mentioned above) as well as Schöber's (2008) research that finds that PE-backed companies that are taken public in times with high overall IPO activity, perform worse in the aftermarket than those that are taken public in times of low activity. For Nordic PE-backed IPOs (based on our results), the opposite seems to be true. In the shorter-to-medium-term (12 months and 24 months) the abnormal returns for the different groups show that PE-backed companies taken public in times of high IPO activity outperform other PE-backed companies at a 5% significance level (using both CAR and BHAR). In the longer-term, only BHAR show evidence of outperformance by companies taken public in times of high activity (at a 10% significance level). To further isolate the IPOs in times of high activity, we group together the IPOs in low and medium activity times and compare the performance against IPO in high activity. The results are shown in Table 18.

Table 18. Abnormal returns for PE-backed IPOs based on the market's average P/E multiple valuation at the time of IPO

	CAR			BHAR		
	12 months	24 months	36 months	12 months	24 months	36 months
Low/med.	-1.9%**	-1.9%***	2.6%	8.7%**	27.3%***	8.0%**
High	14.8%**	17.7%***	13.0%	14.9%**	21.2%***	19.6%**
p-values	0.02	0.01	0.22	0.03	0.01	0.05

Note: p-values are derived from a two-sided Kruskal-Wallis Test that the groups' means are the same. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

The above results show strong evidence that PE-backed companies that are taken public in times of high IPO activity outperform companies that are taken public in times of medium and low IPO activity. While the results fully contradict the previous research on the topic as mentioned above, it is not entirely unexpected with regards to our study. Schultz (2003) show that IPOs tend to cluster around times of high valuation. He argues that this in turn leads to overall underperformance of IPOs. In the previous section we have results that point towards this direction. However, our data shows that our specific IPO sample does not cluster around times of high valuation, which makes our result more reasonable in one way. It simultaneously raises the interesting question for further studies why this is not the case for the Nordics in the given time period.

4.3. Robustness testing

In the previous section we investigated how different factors in isolation might impact the abnormal returns of PE-backed IPOs and whether the factors showed any evidence of having an explanatory value. In this section we want to test the robustness of combining the different explanatory variables in a joint model and to test to what extent a joint model can explain differences in abnormal performance.

We will follow the methodology used by Schöber (2008) and use the natural logarithm of the wealth relative (WR) as the dependent variable in an ordinary least squares (OLS) regression. The WR for company i from month 1 to T is defined as:

$$WR_i^{1,T} = \frac{1 + R_i^{1,T}}{1 + R_B^{1,T}}$$

The WR of a company is closely related to the BHAR for a company – instead of taking the difference between the buy-and-hold return for the company ($R_i^{1,T}$) between month 1 and T , and subtract it with the buy-and-hold return for the benchmark ($R_B^{1,T}$) for the same period, the buy-and-hold return for company i is increased with 1 (100%) and divided with the buy-and-hold return for the benchmark increased with 1 (100%). If

$WR_i^{1,T} > 1$, company i has performed better than the benchmark, if $WR_i^{1,T} = 1$, company i has performed in line with the benchmark and if $WR_i^{1,T} < 1$, company i has performed worse than the benchmark.

The OLS regression can be expressed in the following way:

$$\begin{aligned} \ln(WR_i) = & \alpha + \beta_1 \times \text{Small-Fund}_i + \beta_2 \times \text{Med/High-Own}_i + \beta_3 \times \text{High-Hold}_i \\ & + \beta_4 \times \text{Low-Value}_i + \beta_5 \times \text{High-Vol}_i + \beta_6 \times \text{Before-Crisis}_i \\ & + \beta_7 \times \text{Ind-Manufact}_i + \varepsilon_i \end{aligned}$$

Where WR_i is the wealth relative for company i , α is the intercept, Small-Fund_i is the dummy variable for whether company i has been taken public by a smaller PE-fund, Med/High-Own_i is the dummy variable for whether company i was subject to a medium-to-long holding period prior to going public, High-Hold_i is the dummy variable for whether company i was subject to high holding period prior to going public, Low-Value_i is the dummy variable for whether company i was taken public in times of low overall market valuations, High-Vol_i is the dummy variable for whether company i was taken public in times of high IPO activity and ε_i is the residual term for company i . Further, we also want to control for other factors that have proven to have an impact on the performance (see Appendix 4 and Appendix 5) and thus include two additional dummy variables to exclude any effects that – Before-Crisis_i is the dummy variable that takes into account whether company i was taking public before the financial crisis (date of Lehman Brothers bankruptcy used as cut-off date, 15/09/2008) and Ind-Manufact_i is the dummy variable that takes into account whether company i is classified to be in the manufacturing industry. $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ and β_7 are the coefficients for the respective dummy variables. Furthermore, it should be noted that we also checked whether any size effect has a significant impact on aftermarket performance, however the results are insignificant (see Appendix 6).

For all the dummy variables in the regression, they either take the value 1 if the condition is satisfied and otherwise, they take the value 0. The result for the OLS regression is shown in Table 19 for the time-periods 12 months, 24 months and 36 months.

Table 19. OLS regression – determinants of aftermarket performance for PE-backed IPOs

	12 months	24 months	36 months
Intercept	-0.096 (0.24)	-0.143 (0.21)	-0.222* (0.08)
Small-Fund	0.180** (0.02)	0.185* (0.08)	0.036 (0.76)
Med/High-Own	0.080 (0.23)	0.052 (0.57)	0.169* (0.10)
High-Hold	0.005 (0.95)	0.045 (0.68)	0.126 (0.31)
Low-Value	0.053 (0.52)	0.074 (0.52)	0.095 (0.46)
High-Vol	0.120* (0.07)	0.157* (0.08)	0.114 (0.26)
Before-Crisis	-0.159*** (0.01)	-0.201** (0.02)	-0.172* (0.08)
Ind-Manufact	0.067 (0.24)	0.198** (0.02)	0.220** (0.02)
Observations	58	58	58
Adjusted R ²	20.1%	16.0%	13.6%
F-value	3.05***	2.55**	2.28**

Note: Number in brackets indicate p-values. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

Table 19 indicates that the regression is highly significant for all time periods (1% significance for 12 months and 5% significance for 24 months and 36 months). Furthermore, adjusted R²-values are relatively high as well (14%-20%) when compared to previous research on the topic. However, several of the factors that in isolation had a high significance (medium/high retained ownership, high holding period, low valuation) fail to show significance to the same extent in the combined regression. Only small-fund size succeeds to show similar results in the combined regression as in isolation. A plausible explanation for this could be that several of the factors are intercorrelated which thus may impact the explanatory value when tested in combination. However, it is interest to note that the coefficients for all variables and for all time-periods have the same sign as when tested in isolation for explanatory value for BHARs. The dummy-variable for before/after crisis is significant for all time-periods and the dummy-variable

Nonetheless, the results presented in Table 19 holds up strong when compared to similar analysis made by others. Schöber (2008) has an adjusted R²-values of 3%-8% with five independent variables, however showing higher F-values and a higher number of variables that were significant. Schöber finds that IPOs with a short holding period

underperform in comparison to other IPOs (significance at a 1% level for holding periods of three, four and five years), which is in line with our results however we do not get significance for that in the regression. Further, he finds that companies that went public when the IPO activity was high underperform (significance at a 1% level for holding periods of three and four years), which is opposite to our results that companies that are taken public in times of high IPO activity perform better (10% significance for holding periods of one and two years). Cao & Lerner (2009) have an adjusted R^2 values ranging between 5%-20% and include seven independent variables. They find that, just as Schöber (2008), that a longer holding period affects the aftermarket performance in a negative way.

5. Implications and Conclusions

This paper has investigated the aftermarket performance of private equity-backed IPOs and compared the results to the non-private equity-backed IPOs during the years of 2001-2016 as well as investigated what determines the aftermarket performance of private equity-backed IPOs. Using a set of 309 IPOs, of which 58 are private equity-backed, the broad research questions used in the paper are: Do private equity backed IPOs outperform non-private equity backed IPOs? What factors determine the aftermarket performance?

From these broad research questions, we formulated six hypotheses. The hypotheses are presented below.

Hypotheses conclusion		Support
H ₁	PE-backed IPOs perform better than non-PE-backed IPOs	Yes*
H ₂	A larger fund size has a positive effect on stock performance	No
H ₃	A larger retained share by the private equity firm at the time of IPO has a positive effect on stock performance	Yes***
H ₄	A longer holding period has a positive effect on stock performance	Yes*
H ₅	PE-backed companies that are taken public in times of low valuations perform better than those that are taken public in times of high valuations	Yes*
H ₆	A higher IPO volume in the overall market has a negative performance effect on PE-backed IPOs	No

Note: * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level. The significance levels refer to three-year BHAR.

Consistent with our first hypothesis we find that PE-backed IPOs outperform their non-PE-backed counterparts. We furthermore find that the underlying determinants of stock performance that seem to affect PE-backed companies are retained share, holding period and valuation levels at the time of IPO. IPO volume seems to have the opposite effect in comparison to our hypothesis, with strong evidence suggesting that Nordic PE-backed companies that are taken public in times of high IPO activity outperform other PE-backed IPOs. Previous research suggest that IPOs tend to cluster around times of high valuations which in itself is a plausible determinant of overall underperformance of IPOs. Our specific IPO sample does not cluster around times of high valuation, which

could be a reason that our IPO volume hypothesis does not hold. This raises the interesting question for further studies why this is not the case for the Nordics in the given time period. While we do not find that a larger fund size has a positive effect on performance, we find that the opposite is true in the short-term (see Appendix 1). Perhaps underlying incentives of smaller funds leads to differences in operational performance, which is subsequently reflected in the stock performance. Furthermore, as this study has limited its scope to solely examine stock performance, new research includes understanding what affects operational performance and also how operational performance is reflected into stock performance.

6. References

- Bain & Company (2019). *Global Private Equity Report 2019*. Retrieved from https://www.bain.com/contentassets/2792a2cbcdcf4e94acfdcd077a85c5ea/bain_report_private_equity_report_2019.pdf
- Barber, B. M. & Lyon, J. D. (1997). Detecting long-run abnormal stock returns: The empirical power and specification of test statistics. *Journal of Financial Economics*, 43(3), 341-372.
- Bergström, C., Nilsson, D. & Wahlberg, M. (2006). Underpricing and Long-Run Performance Patterns of European Private-Equity-Backed and Non-Private Equity-Backed IPOs. *The Journal of Private Equity*, 9(4), 16-47.
- Brav, A. & Gompers, P. A. (1997). Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Nonventure Capital-Backed Companies. *The Journal of Finance*, 52(2), 1791-1821.
- Brav, A., Geczy, C. & Gompers, P. A. (1999). Is the abnormal return following equity issuances anomalous? *Journal of Financial Economics*, 56(2), 209-249.
- Cao, J. & Lerner, J. (2009). The performance of reverse leveraged buyouts. *Journal of Financial Economics*, 91(2) 139-157.
- Cao, J. X. (2011). IPO Timing, Buyout Sponsors' Exit Strategies, and Firm Performance of RLBOs. *The Journal of Financial and Quantitative Analysis*, 46(2), 1001-1024.
- Demiroglu, C. & James, C. M. (2010). The role of private equity group reputation in LBO financing. *Journal of Financial Economics*, 96(2), 306-330.
- EVCA (2014). *Nordic private equity in the context of Europe*. Retrieved from <https://www.investeurope.eu/media/141142/EVCA-Nordic-Presentation.pdf>
- Fama, E. F. (1998). Market efficiency, long-term returns, and behavioural finance. *Journal of Financial Economics*, 49(3), 283-306.
- Gohil, R. & Vyas, V. (2015). Performance of Private Equity Backed Initial Public Offerings: Empirical Evidence from India. *The Journal of Private Equity*, 18(4), 56-64.
- Gompers, P. A. & Lerner, J. (2003). The Really Long-Run Performance of Initial Public Offerings: The Pre-Nasdaq Evidence. *The Journal of Finance*, 58(4), 1355-1392.
- Hahl, T., Vähämaa, S. & Äijö, J. (2014). Value versus growth in IPOs: New evidence from Finland. *Research in International Business and Finance*, 31, 17-31.
- Kaplan, S. N. & Strömberg, P. (2009). Leveraged Buyouts and Private Equity. *The Journal of Economic Perspectives*, 23(1), 121-146.
- Lerner, J. (1994). Venture capitalists and the decision to go public. *Journal of Financial Economics*, 35(3), 293-316.
- Levis, M. (2011). The Performance of Private Equity-backed IPOs. *Financial Management*, 40(1), 253-277.
- Loughran, T. & Ritter, J. R. (1995). The New Issues Puzzle. *The Journal of Finance*, 50(1), 23-51.

- Loughran, T., Ritter, J. R. & Rydqvist, K. (1994). Initial public offerings: International insights. *Pacific-Basin Finance Journal*, 2(2-3), 165-199.
- Lowry, M. (2003). Why does IPO volume fluctuate so much? *Journal of Financial Economics*, 67(1), 3-40.
- Miljarder värdelösa i OW Bunker. (2014, November 10). *SvD*. Retrieved from <https://www.svd.se/miljarder-vardelosa-i-ow-bunker>
- Miller, E. M. (1977). Risk, Uncertainty, and Divergence of Opinion. *The Journal of Finance*, 32(4), 1151-1168.
- Mitchell, M. L. & Stafford, E. (2000). Managerial Decisions and Long-Term Stock Price Performance. *The Journal of Business*, 73(3), 287-329.
- Myers, S. C. (1984). The Capital Structure Puzzle. *The Journal of Finance*, 39(3), 575-592.
- Pagano, M., Panetta, F. & Zingales, L. (1998). Why Do Companies Go Public? An Empirical Analysis. *The Journal of Finance*, 53(1), 27-64.
- Povaly, S. (2006). *Private Equity Exits: An analysis of divestment process management in relation to leveraged buyouts*. (Doctoral thesis, University of St. Gallen, St. Gallen). Retrieved from [https://www1.unisg.ch/www/edis.nsf/SysLkpByIdentifier/3238/\\$FILE/dis3238.pdf](https://www1.unisg.ch/www/edis.nsf/SysLkpByIdentifier/3238/$FILE/dis3238.pdf)
- PwC (2015). *IPO Watch Europe 2014*. Retrieved from https://www.pwc.pl/pl/ipo-watch-europe/assets/annual_ipo_watch_europe_2014.pdf
- PwC (2018). *European private equity IPO report (November 2018)*. Retrieved from <https://www.pwc.de/de/finanzinvestoren/pwc-private-equity-ipo-report-2018.pdf>
- Ritter, J. R. (1991). The Long-Run Performance of Initial Public Offerings. *The Journal of Finance*, 46(1), 3-27.
- Schöber, T. (2008). *Buyout-Backed Initial Public Offerings*. (Doctoral thesis, University of St. Gallen, St. Gallen). Retrieved from [https://www1.unisg.ch/www/edis.nsf/SysLkpByIdentifier/3479/\\$FILE/dis3479.pdf](https://www1.unisg.ch/www/edis.nsf/SysLkpByIdentifier/3479/$FILE/dis3479.pdf)
- Schultz, P. (2003). Pseudo Timing and the Long-Run Underperformance of IPOs. *The Journal of Finance*, 58(2), 483-517.

7. Appendices

Appendix 1. Equal-weighted abnormal returns for PE-backed IPOs based on level of fund size

	CAR			BHAR		
	12 months	24 months	36 months	12 months	24 months	36 months
Low	31.6%*	28.2%	14.3%	47.3%**	86.4%	39.3%
Med./High	-0.2%*	1.8%	6.6%	0.5%**	2.8%	8.6%
p-values	0.06	0.21	0.61	0.05	0.22	0.76

Note: p-values are derived from a two-sided Kruskal-Wallis Test that the groups' means are the same. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

Appendix 2. Equal-weighted abnormal returns for PE-backed IPOs based on the PE funds retained ownership at the time of IPO

	CAR			BHAR		
	12 months	24 months	36 months	12 months	24 months	36 months
Low/Med.	3.9%	6.7%	4.8%	5.1%***	6.4%**	4.1%***
High	21.5%	20.2%	21.5%	33.9%***	72.6%**	46.9%***
p-values	0.72	0.98	0.69	0.01	0.02	0.01

Note: p-values are derived from a two-sided Kruskal-Wallis Test that the groups' means are the same. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

Appendix 3. Equal-weighted abnormal returns for PE-backed IPOs based on the PE funds retained ownership at the time of IPO

	CAR			BHAR		
	12 months	24 months	36 months	12 months	24 months	36 months
Low	-20.7%**	-17.4%*	-31.4%**	-18.0%***	-16.7%***	-27.2%***
Med./High	18.6%**	19.9%*	23.2%**	23.2%***	37.5%***	30.0%***
p-values	0.02	0.06	0.02	0.00	0.00	0.00

Note: p-values are derived from a two-sided Kruskal-Wallis Test that the groups' means are the same. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

Appendix 4. Abnormal returns for PE-backed IPOs based whether they were listed before or after the financial crisis.

	CAR			BHAR		
	12 months	24 months	36 months	12 months	24 months	36 months
Before	-3.6%***	-4.1%**	-6.9%**	5.4%***	27.2%**	6.6%**
After	17.0%***	20.4%**	20.4%**	17.6%***	21.0%**	21.3%**
p-values	0.01	0.02	0.02	0.01	0.02	0.03

Note: p-values are derived from a two-sided Kruskal-Wallis Test that the groups' means are the same. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

Appendix 5. Abnormal returns for PE-backed IPOs based on industry classification

	CAR			BHAR		
	12 months	24 months	36 months	12 months	24 months	36 months
Manufac.	12.9%	27.5%	29.8%*	21.1%	61.4%	45.4%*
Other	5.5%	-1.1%	29.8%*	6.9%	-1.3%	-4.7%*
p-values	0.77	0.13	0.08	0.89	0.19	0.07

Note: p-values are derived from a two-sided Kruskal-Wallis Test that the groups' means are the same. Date of Lehman Brothers bankruptcy (15/09/2008) used as cut-off date. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

Appendix 6. Abnormal returns for PE-backed IPOs based on market capitalization

	CAR			BHAR		
	12 months	24 months	36 months	12 months	24 months	36 months
Low/Med.	13.1%	12.8%	16.3%	19.9%	40.4%	26.8%
High	4.7%	8.1%	3.3%	6.6%	9.8%	5.7%
p-values	0.93	0.52	0.85	0.99	0.37	0.99

Note: p-values are derived from a two-sided Kruskal-Wallis Test that the groups' means are the same. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.