

The performance of Nordic buyout-backed IPOs

An empirical study on first-day returns, aftermarket abnormal returns and IPO cyclicity

Johanna Sevonius[♣]

Johan Hertervig[♣]

ABSTRACT

Using a sample of 443 Nordic IPOs, consisting of 53 buyout-backed, 70 venture capital-backed and 320 non-sponsored issues from January 1997 to December 2010, this paper investigates the financial performance of buyout-backed IPOs listed on the Nordic stock exchanges. We compare and contrast the first-day returns and aftermarket abnormal returns over a period of three years of buyout-backed IPOs to those of non-sponsored and venture capital-backed. We employ two alternative benchmarks in the abnormal return calculations and use two abnormal return metrics to strengthen the validity of our results. Evidence is also presented for the financial performance of the IPOs depending on market condition at time of issuance. Our results indicate that buyout-backed in the Nordics experience lower average first-day returns and generally less negative abnormal returns in most periods leading up to three year aftermarket performance period than those of venture capital-backed and non-sponsored IPOs. Buyout-backed IPOs issued in high IPO activity market conditions tend to experience higher first-day returns and less negative aftermarket abnormal returns than buyout-backed IPOs issued in other periods. None of the results are statistically significant though.

Key words: Nordic buyout-backed IPOs, first-day returns, aftermarket abnormal returns, IPO cyclicity

Tutor: Håkan Thorsell

Presentation: 28 May, 2014

Location: Stockholm School of Economics

Discussants: Rickard Zetterqvist and Christoffer Andersson

Acknowledgement: We would like to thank our tutor, Håkan Thorsell, for valuable input and comments during the process of writing. We would also like to thank Michael Halling and Per-Olof Edlund, for helpful assistance and advice on statistical issues.

[♣] 21828@student.hhs.se

[♣] 21971@student.hhs.se

Table of Contents

1	INTRODUCTION.....	1
2	DEFINITIONS.....	3
3	PREVIOUS RESEARCH, THEORIES AND HYPOTHESES.....	4
3.1	First-day returns.....	4
3.1.1	Previous research.....	4
3.1.2	Theories explaining first-day returns.....	4
3.2	Aftermarket performance.....	6
3.2.1	Previous research.....	6
3.2.2	Theories explaining underperformance.....	7
3.3	Cyclicality and IPO performance.....	9
3.3.1	Previous research.....	9
3.3.2	Theories explaining cyclicality and IPO performance.....	9
3.4	Summary and hypotheses formulation.....	10
4	METHOD.....	13
4.1	First-day returns.....	13
4.2	Aftermarket performance measurement.....	15
4.2.1	Time regimes.....	15
4.2.2	Abnormal return metrics in event time.....	16
4.2.3	Abnormal return metrics in calendar time.....	18
4.2.4	Market period definition.....	20
4.2.5	Benchmarks.....	20
4.2.6	An example of event time vs. calendar time.....	21
4.3	Test statistics.....	22
5	DATA.....	24
5.1	Sample identification and supplemental data.....	24
5.2	Data collection criticism.....	26
6	RESULTS AND ANALYSIS.....	27
6.1	Descriptive statistics.....	27
6.2	First-day returns.....	30
6.3	Aftermarket performance.....	36
6.3.1	Event time results.....	36
6.3.2	Calendar time results.....	44
6.3.3	Cyclicality and aftermarket performance.....	46
7	CONCLUSIONS.....	51
8	REFERENCES.....	55
9	APPENDIX.....	59

1 Introduction

The recent surge in initial public offering (IPO) activity in the Nordic¹ region has generated considerable media attention and has fuelled the debate about the financial performance of IPOs in general and of IPOs backed by private equity buyout (BO) funds in particular (Bråse, 2011; Högberg, 2012; Andersson, 2013). High stock market valuations have resulted in a large line-up of BO-backed IPOs of substantial size about to be put on the market in the Nordic region (Goksör, 2013; Sundberg, 2013; PwC Riskpremiestudien, 2014). In late 2013 and the beginning of 2014, the Nordic equity market experienced high profiled transactions such as the EQT Partners BO-backed IPOs of Sanitec and ISS as well as the IPOs of Bufab and OW Bunker backed by BO funds advised by Nordic Capital and Altor Equity Partners respectively (Nordenstam & Pollard, 2013; Wienberg, 2014).

While the press from time to time tend to be very critical towards IPOs backed by private equity BO funds, prior empirical studies reveal another story. Research on BO-backed IPOs, conducted mainly on the US markets, show that IPOs backed by BO funds outperform other IPOs (e.g. Holthausen and Larcker, 1996; Cao and Lerner, 2009), which are sometimes classified as either venture capital-backed (VC-backed) or non-sponsored (NS) (c.f. Levis, 2011). The evidence from European markets, although limited to a few markets and time periods, provides further support for the superior aftermarket stock performance of BO-backed IPOs compared to those backed by VC funds or NS ones (Bergström et al., 2006; Levis, 2011). BO-backed IPOs could be seen as a special subgroup of IPOs due to their typical characteristics that distinguishes them from other IPO's. These include, for example, a higher leveraged capital structure and a large retained ownership by the BO fund, which is usually divested within a few years after the IPO (Schöber, 2008; Levis, 2011). Moreover, Kaplan & Strömberg (2008) argue that the access to capital, improved governance structures and optimized operating performance are activities that differentiate private equity BO owned companies. Consequently, their performance pattern looks somewhat different than that of non-BO-backed IPOs, rendering precise inference from general research on IPO performance, of which there is plenty, infeasible (Schöber, 2008; Levis, 2011).

¹ For this paper the Nordic region is defined as Sweden, Denmark, Norway and Finland. Although Iceland also belongs to the Nordic region geographically and culturally, the private equity BO activity on there is negligible.

Spliid (2013) notes that there is almost no literature describing and analysing the Nordic private equity market and Westerlund (2007) claims that no study, except his, has investigated the performance of the Nordic IPO market. As mentioned, a lot of of the previous research within the topic of IPO performance is conducted on the US market (Levis, 2011). Consequently, much of the theories are developed and tested for this market (Spliid, 2013). Spliid (2013) argues that the environments surrounding BO firms differ between the US and the Nordic countries in terms of management culture, jurisdiction, fundraising, political focus of BO firms, among others. Although the environments are different, Spliid (2013) argues that the theories are not irrelevant but rather needs to be empirically tested on the Nordic market.

Given that private equity BO funds in recent history have been involved in some of the largest IPOs in the region and have grown from the nineties onwards to become one of the Nordic region's most important investor groups (Spliid, 2013), it is surprising that the matter has not been given more room in academic research. Combined with the fact that Nordic private equity BO industry has entered a period of large divestments, where many are expected to be sold as IPOs to institutions and the general public (PwC Riskpremiestudien, 2014), we feel that an empirical study on the performance of BO-backed IPOs on the Nordic markets is warranted. This study aims to contribute to the existing body of research by presenting empirical evidence on the matter from the Nordic region. Moreover the paper specifically addresses the performance of BO-backed IPOs depending on type of market condition at the time of the IPO, an area of research that has been attended to in the general IPO performance literature but has been somewhat overlooked in the area of research dealing specifically with BO-backed IPOs (Bergström et al., 2006; Schöber, 2008). The results will provide interesting insights for financial sponsors, issuing firms, underwriters and investors on the Nordic markets. Our research questions are:

How do BO-backed IPOs in the Nordics perform and do the performance of these IPOs differ depending on the market conditions at the time of issuance?

To investigate our research questions we collect a sample of 443 IPOs, comprised of 53 BO-backed, 70 VC-backed and 320 NS issues from January 1997 to December 2010. We compare and contrast the first-day returns and aftermarket abnormal returns of buyout-backed IPOs to those of NS and VC-backed using several methods and metrics in attempts to strengthen the validity of our results. To control for risk in the abnormal returns calculations we employ the

broad MSCI Nordic index as well as six self-constructed portfolios that are matched to our sample on size and book-to-market ratios. We calculate the buy-and-hold abnormal returns (BHAR) and cumulative abnormal returns (CAR) for selected periods leading up to a three year term. Evidence is also presented for the financial performance of the IPOs depending on market condition at time of issuance. Our findings suggest that BO-backed IPOs in the Nordic region experience lower first-day returns and generally less negative abnormal returns in the three year aftermarket period than VC-backed and NS IPOs. The differences are, however, not statistically significant. BO-backed IPOs issued in market conditions characterised by high IPO activity experience higher first day returns and less negative aftermarket median abnormal returns than BO-backed IPOs issued in other periods. However, these results are not statistically significant either.

The remainder of this paper is organised as follows. Section 2 presents a few key definitions employed throughout this paper. Section 3 contains a brief review of the previous research on the first-day return and aftermarket performance of BO-backed IPOs followed by theories that tries to explain these prior empirical results. This section also presents previous research and theories of IPO cyclicalty and performance and ends with a presentation of our hypotheses based on the previous literature. Section 4 provides a thorough explanation of the methods utilised in this study and section 5 carefully lays out the data collection procedure and data criticism. Section 6 presents the empirical results and analysis of our study on the Nordic IPO market. Section 7 concludes by summarising the insights from this study.

2 Definitions

The European Private Equity and Venture Capital Association, EVCA, (2007) defines private equity as “the provision of capital by financial investors, over the medium or long term, to non-quoted companies with high growth potential” (p. 6). The association further defines VC as “a subset of private equity referring to equity investments made for the launch, early development or expansion of a business with particular emphasis on entrepreneurial undertakings rather than on mature businesses” (p. 6). Finally, EVCA (2007) defines a BO as “a transaction in a more mature stage of a company’s lifecycle where a significant amount of the financing required is often provided by bankers and other lenders in the form of various types of debt” (p. 6). For this paper, similar to Levis (2011), we make a distinction between BO-backed and VC-backed IPOs and employ both definitions established by EVCA. All other IPOs are classified as non-

sponsored (NS). The focus, however, will, as stated in the research question, be on BO-backed IPOs.

3 Previous research, Theories and Hypotheses

3.1 First-day returns

3.1.1 Previous research

First-day return refers to the return that shareholders receive when a share is bought at its offer price in an IPO and sold at its first closing day-price (van Frederikslust & van der Geest, 2004). The phenomenon was first documented in beginning of 1970 by for example Ibbotson (1975). Since then several researchers have reaffirmed that IPOs, on average, generate positive first-day returns regardless of time period and geographical market (Beatty & Ritter, 1986; Ritter & Welch, 2002). The persistence of these positive returns has proven so strong that many researchers use the terms first-day return and underpricing interchangeably (Ritter & Welch, 2002).

For industrialized countries, the average underpricing is usually in the range of 15-18 percent while the effect is significantly higher in developing countries (Jenkinson & Ljungqvist, 2001). In addition to differences in underpricing between countries, the degree of underpricing also varies across different types of IPOs. Bergström et al. (2006), Levis (2011) and Mogilevsky & Murgulov (2012), for example, find that IPOs backed by private-equity BO funds exhibit significantly lower levels of underpricing than other IPOs. However, Bergström et al. (2006) observe that timing of IPO, size of the floated company and listing market had larger effects on underpricing than presence of being a BO-backed IPO or not.

3.1.2 Theories explaining first-day returns

Over time, a wide range of theoretical explanations to IPO underpricing phenomenon have been developed and almost all are based on theories of asymmetric information (Bergström et al., 2006). IPOs create asymmetric information situations between the issuing firm, the underwriter and investors buying into the IPO. Bergström et al. (2006) emphasise that the reasons behind underpricing depend on which of these key parties hold more information than the other.

For investors, the information asymmetry can be described as the investors' ex-ante uncertainty about the true offering value of the share. Even though, on average, IPOs are underpriced,

investors purchasing an IPO share can never be certain about the offering's value once it starts publicly trading. Beatty & Ritter (1986) argue that the greater the ex-ante uncertainty is, the greater return will be required by investors implying greater expected underpricing. They further claim that by ensuring that all relevant information is disclosed at the IPO, the issuing firm can reduce the ex-ante uncertainty and information asymmetry between the investor and issuing firm.

In order to minimize the information asymmetry and the ex-ante uncertainty, the most informed parties about an IPO firm's true value, often the issuers and/or underwriters may use underpricing to certify that the IPO firm is of high quality. This is called the certification hypothesis and is one of the most shared explanations of the short run performance of an IPO firm. This hypothesis states that the involvement of the issuing firm at a stock introduction may have a certification effect concerning the quality of the floated firm (van Frederikslust & van der Geest, 2004). Megginson & Weiss (1991) examined the certification hypothesis for the American market and found that the involvement of private equity player at the IPOs leads to less underpricing. The importance of repeated fundraising and successful exits suggest BO firms may be reluctant to take a low quality firm public since they arguably stake their reputation at a higher level in an IPO than in any other exit route given the degree of publicity surrounding an IPO (Bergström et al., 2006). It is therefore likely that the mere presence of a BO-backed IPO may signal high quality and reduce the adverse selection problem, ultimately resulting in less underpricing.

Less underpricing of BO-backed IPOs can also be explained by the fact that they tend to be subject to more scrutiny during the investment period, during the holding period and at the IPO, contributing to greater degree of publicly available information, ultimately leading to less ex-ante uncertainty among the investors (Bergström et al., 2006). Another explanation of less underpricing of BO-backed IPOs is put forward by Levis (2011) who emphasises that BO firms have the objective of maximizing the return of their investments. Therefore, it is generally believed that BO firms engage in a more aggressive pricing strategy on the issuing firm. This cause investors to adjust their perception of the offering price resulting in relatively modest first-day returns.

Beatty & Ritter (1986) argue that underwriters may alter the extent of underpricing to please either the issuing client or IPO investors, depending on which group they believe is capable of

providing the bank with more future revenue. The underwriter may use underpricing as a measure to obtain full subscription from investors (Bergström et al., 2006). However, if the underwriter underprices the IPO too heavily it risks losing business from issuers. Hence, the underwriter often has an incentive to perform an accurate certification of the company (Booth & Smith, 1986). This may be especially true if the issuer is a BO firm since they often are lucrative repeats customers of investment banks. Mogilevsky & Murgulov (2012) therefore conjecture that presence of BO firms in an IPO reduces or eliminates the advantage that underwriters usually have when it comes to IPO pricing negotiations with owners of the firm.

3.2 Aftermarket performance

3.2.1 Previous research

A recurring term in the previous literature examining aftermarket performance of IPOs is underperformance. Underperformance refers to when the long run return of an IPO fall below some kind of benchmark (van Frederikslust & van der Geest, 2004). By matching 1526 US IPOs in the period 1975-84 to non-IPO firms by industry and market capitalisation, Ritter (1991) finds evidence of IPO underperformance in the three years after going public. There is however considerable variation in the underperformance from year-to-year and across industries, with companies going public in high-volume years performing the worst. Loughran & Ritter (1995) document similar underperformance but over a time-period of five years between 1970-90. Ibbotson (1975) demonstrate that aftermarket performance may depend upon the measurement period. As mentioned before, Westerholm (2007) argues that few studies have examined the IPO aftermarket performance on the aggregated Nordic market. He finds that Nordic IPOs, similar to American ones, exhibit a negative aftermarket performance over five years.

While much evidence regarding aftermarket performance suggests significant underperformance (Levis, 2011), the results are controversial. Brav & Gompers (1997) and Gompers & Lerner (2003) show that IPOs in general do not perform worse than benchmark if IPO firms are matched to a portfolio of non-IPO firms on the basis of size and book-to-market ratios. Hence, by matching IPO firms to non-IPO firms with similar characteristics, they reject the existence of any abnormality. They also conclude that relative performance crucially depends on the method of examining performance and which benchmark that is used.

Empirical research point towards significant differences in performance between different types of IPOs (Brav & Gompers, 1997; Bergström et al., 2006; Cao & Lerner, 2009; Levis, 2011). Brav

& Gompers (1997) attribute much of the underperformance demonstrated by Ritter (1991) and Loughran & Ritter (1995) to small non-venture backed IPOs. These IPOs have returns significantly below those of VC-backed IPOs but once returns are value weighted the difference in performance between the groups are reduced. The evidence is largely consistent when examining a subset of BO-backed IPOs called reverse leveraged buyout (RLBOs)². In their study of these, Cao & Lerner (2009) document negative median abnormal returns over three, four and five years after the IPO, but notes that the RLBOs still outperform other IPOs across various benchmarks.

The evidence regarding aftermarket performance of BO-backed IPOs outside the United States is rather sparse and inconclusive (Levis, 2011). Using a sample of BO-backed, VC-backed and NS IPOs in UK, Levis (2011) finds evidence of negative average abnormal returns for the entire sample, mainly attributable to the poor performance of NS IPOs. BO-backed IPOs, on the other hand, experience positive and significant abnormal returns over a three-year period regardless of benchmarks used. Bergström et al. (2006) find that BO-backed IPOs outperform non BO-backed IPOs across time horizons of six months, three years and five years in IPOs on the London Stock Exchange and Paris Stock Exchange. BO-backed IPOs have positive abnormal returns over the first six months but negative abnormal returns over time periods of three and five years.

3.2.2 Theories explaining underperformance

This section presents the main empirical explanations of IPO aftermarket performance. The first explanation is widely used and found in behavioural finance theory. It holds investor sentiment responsible for the aftermarket performance. Miller (1977) assumes that investors have diverse set of expectations regarding the real value of an IPO, thus investors have more or less diverging opinions. The investors with the most positive expectations of the IPO firm are most likely to buy into the IPO. These investors push the stock price upwards. Ritter (1991) and Loughran & Ritter (1995) document that investors misestimate the probability of finding winners. Investors are systematically too optimistic and misevaluate the future prospects for floated firms. Over time, more information will become available and the marginal investor's valuation will converge towards equilibrium, and its price will fall (Ritter & Welch, 2002; Bergström et al., 2006). Aggarwal & Rivoli (1990) explain this performance pattern by the so-called "fads theory". When the overoptimistic investors realize they bid too aggressively in the auction, they will begin to

² A term for the IPO of a company that has previously been publicly listed and acquired in a leveraged buyout transaction by a private equity buyout firm and simultaneously delisted.

reassess their expectations causing stock prices to decline. Brav & Gompers (1997) and Bergström et al. (2006) also argue that the more severe underperformance of small firms can be attributable to that they have a larger fraction of irrational investors. These investors are often comprised by individuals which tend to suffer from asymmetric information, be less informed and behave more optimistically than institutional investors. Contrarily, the aftermarket performance pattern of lower underpricing and underperformance of BO-backed IPOs, which in general are larger companies, can be explained by a larger fraction of institutional investors acting more professionally in the book building or auction resulting in less adjustment in the aftermarket (Bergström et al., 2006).

Bergström et al. (2006) argue that performance of BO-backed IPOs in the early post-IPO period up to six months may to some extent depend upon the amount of retained shares and the degree of underpricing. Due to lock-up agreements, BO firms normally retain a large fraction of shares in the IPO over a short period of time before selling off the shares step-wise. Thereby, BO firms may be inclined to act short sighted leading to a stock price appreciation over a shorter period of time after the IPO before deteriorating in the long run (Bergström et al., 2006).

A third explanation is presented by Schultz (2003). He argues that firms choose to go public when they see that other firms are obtaining a high price from issuing shares. Consequently, more IPOs often follow successful IPOs. This phenomenon is referred to as pseudo market timing and tends to incur when markets are peaking. Thus, the last group that decides to issue shares based on the observation of successful IPOs will underperform. If underperformance is measured in event time, high-volume years will be assigned a higher weight. As a result, the average IPO will underperform, as illustrated in the example presented section 4.2.6. This can however be mitigated by measuring calendar time returns, an alternative abnormal return method.

While the aftermarket IPO performance is a controversial area, researchers have contended that magnitude of long-run abnormal performance is sensitive to the procedure employed (Ritter & Welch, 2002) and that the conventional measurement methodologies do not necessarily fully capture the distinctive risks associated with the different types of IPOs (Levis, 2011). That is that underperformance may simply be an illusion caused by wrong measurement method (Brav and Gompers, 1997).

3.3 Cyclicity and IPO performance

3.3.1 Previous research

Empirical evidence shows that IPO activity is cyclical and substantially higher in booming markets with high stock market valuations (Ibbotson, 1975; Ritter & Welch, 2002; Schöber, 2008). Several studies have revealed that first-day returns are highly cyclical and affected by stock market conditions (e.g. Ibbotson & Jaffe, 1975; Ritter, 1984; Loughran & Ritter, 2004; Levis, 2011). For example, Loughran and Ritter (2004) documents that average first-day return under the hot market period 1999-2000 was 65%, compared to an average return of 11.7% in the three following years. Bergström et al. (2006) and Levis (2011) also notes that non-BO-backed IPOs' degree of underpricing were affected to a larger extent by the market conditions surrounding the high IPO activity period in the years preceding the new millennium than those of BO-backed.

Ritter (1991) finds evidence of a negative relationship between the volume of issuances and aftermarket performance on the US market. He reveals that the IPOs floated in the high issue period in early 1980s showed the most severe long-run underperformance. Similar findings are demonstrated by Bergström et al. (2006) but on the Paris Stock Exchange and London Stock Exchange and for years around the Dot-com bubble, 1999-2000. The pattern of underperformance following high volume years are also demonstrated for BO-backed firms by Schöber (2008). Additionally, Cao and Lerner (2009), provide evidence that RLBO, that are hastily flipped and introduced on the stock exchange to take advantage of high market valuations do indeed underperform compared to other RLBOs.

As BO firms have several different exit options, previous literature (e.g. Bergström et al., 2006; Schöber, 2008) has hypothesised that BO-firms are actively trying to time periods of high valuation when they sell their holdings on the public stock market. The results are however mixed, as Bergström et al. (2006) find that fewer BO-backed firms go public during high-volume years than NS firms whereas Schöber (2008) reveals that BO-backed IPOs are timing high volume IPO markets.

3.3.2 Theories explaining cyclicity and IPO performance

As the decision of IPO timing is at the discretion of management and owners, market timing theories has become the most widely discussed reason for cyclicity of IPOs (Schöber, 2008). As was briefly mentioned in section 3.2.2, a key market timing issue is the pseudo market timing theory. The theory rests on the premise that more firms are floated as stock market prices

increases. According to this theory, the decision to raise equity has nothing to do with managers predicting future returns. The reason why higher stock prices result in more offerings is unimportant for the pseudo market timing hypothesis. Instead the theory predicts that management use trigger prices to determine when to issue equity, that is they issue when the stock is above a certain level (Schulz, 2003). Empirical evidence supports this assumption. Loughran, Ritter & Rydkvist (1994) show that the number of IPOs increases with the general level of the stock market in 14 of 15 countries they study.

In their survey of the IPO literature, Ritter & Welch (2002) concluded that market conditions are the most important factor in the decision to go public. Pastor & Veronesi (2005) introduces the term “optimal IPO timing” and suggests that entrepreneurs tend to wait for more favourable market conditions before going public. Ritter (1991) argue that the negative aftermarket performance following high volume years may be a result of investor sentiment and the fads theory. In high periods, the over optimism of investors about the future prospects of the firm become more pronounced than in other periods. As the market begins to slow down, investors reassess their expectations downwards over time leading to a more severe deteriorating pattern of return.

In a BO context, sponsors may react to IPO market conditions as they determine when to divest the holdings in a portfolio company through an IPO. This may induce BO sponsors to sell a company before the restructuring process is complete. In a more recent study, Cao (2011) finds that BO sponsors tend to shorten the BO-duration when market conditions are more favourable for new IPOs. This in turn leads to poor aftermarket performance and a greater probability of bankruptcy.

3.4 Summary and hypotheses formulation

The previous literature presented on BO-backed IPOs is centred around the three key themes of first-day return, aftermarket performance and cyclicity effects. While there exists some research documenting the first two of these, less attention has been given to how these measures of performance behave in different market conditions (Schöber, 2008). Moreover, most studies on BO-backed IPO performance have been conducted in the US, where the BO-industry and its business environment as well as certain national cultural and institutional aspects differ from the Nordic region (Spliid, 2013). The dynamics of the BO-industry and its environment has also changed over time (Cao & Lerner, 2009). Competition has hardened, potential targets have become more sophisticated about valuations (Cao & Lerner, 2009) and the events around the

financial crisis and the European sovereign debt crisis has undoubtedly affected the funds' access to credit financing and fundraising (McCahery & Vermeulen, 2013). As a result firms BO-funds in general are now more proactive than ever about improving the operating performance of their portfolio companies (Star, 2014), activities that may very well impact the performance of BO-backed IPOs. This study aims to contribute to the existing body of research by presenting empirical evidence on BO-backed IPO performance from the Nordic region, using up to date data covering a time period of large game changing macroeconomics events such as the global DOT-com bubble, the worldwide financial crisis and the European sovereign debt crisis. The study also specifically addresses the performance of BO-backed IPOs depending on the market conditions at the time of issuance. Our detailed research focus and hypotheses are presented in the remainder of this section. The a-hypotheses covers all our groups of IPOs and aim to test and introduce material that put our BO-backed IPOs into context. The b-hypothesis expressly contrast our group of BO-backed IPO's to those of VC-backed and NS.

As presented in section 3.1, the underpricing phenomenon has been documented by extensive empirical research as a general issue concerning IPOs and the effect has been related to theories of asymmetric information between the underwriter, the issuer and the investor. Interestingly, the underpricing issue has according to some prior research, conducted mainly on US markets, been less prevalent in BO-backed IPOs than in VC-backed and NS ones. Supported by these previous findings we hypothesise that a similar pattern will be observed in our study on the Nordic markets. Our first two hypotheses are formalized as follows:

- I(a) All IPOs in our sample will experience underpricing irrespective of being BO-backed, VC-backed or NS*
I(b) BO-backed IPOs will experience less underpricing than VC-backed and NS IPOs

Several studies have noted that the degree of underpricing increases in certain market conditions where IPO activity is high (e.g Ritter, 1984, Bergström et al., 2006; Levis, 2011). The phenonomen has, according to these studies, been more prevalent among non BO-backed IPOs than BO-backed IPOs in the high volume years in early 1980s and dot-com bubble. Following these results, we hypothesise the following for our sample on the Nordic markets:

- II(a) All IPOs in our sample will experience higher underpricing in markets characterised by high IPO activity than in other periods, irrespective of being BO-backed, VC-backed or NS*

II(b) BO-backed IPO's degree of underpricing will be less affected in high IPO activity markets than VC-backed and NS IPOs

Underperformance in the aftermarket has according to a large body of empirical research been an issue with IPOs in general. As discussed above, the underperformance of IPOs is generally explained by investor sentiment, pseudo market timing and lack of adequate measurement issues. The results are however controversial, with researchers employing alternative methods stating that there is no underperformance (Brav & Gompers, 1997). Research has also documented that there are variations depending on type of IPO, where BO-backed ones seem to outperform others (Bergström et al., 2006; Cao & Lerner, 2009; Levis, 2011). In spite of the lack of consensus in the matter, we hypothesise that our sample of IPOs on the Nordic markets will underperform in the aftermarket and that BO-backed IPOs will experience less underperformance. The hypotheses are formalised below:

III(a) All IPOs in our sample will experience underperformance irrespective of being BO-backed, VC-backed or NS

III(b) BO-backed IPOs will experience less underperformance than VC-backed and NS IPOs

As noted earlier in section 3.3, empirical evidence has been presented showing that the degree of underperformance of IPOs in general are higher in market conditions characterised by high IPO activity. For BO-backed IPOs, the effect may be even more severe. Since market condition is an important factor to consider when going public, the PE-backed portfolio companies may go public before the restructuring process is complete in order to take advantage of high price levels in the market. This implies that companies may be floated on the stock exchange hastily before they are “ready” with higher risks of bankruptcy and underperformance (Cao, 2011). Following these results and theories we formalise our final two hypotheses below:

IV(a) All IPOs in our sample will experience higher underperformance in market conditions of high IPO activity than in other periods, irrespective of being BO-backed, VC-backed or NS

IV(b) BO-backed IPOs' degree of underperformance will be more affected in high IPO activity markets than VC-backed and NS IPOs

4 Method

4.1 First-day returns

The measurement of initial return in prior studies differs with regards to the length of the time period following the IPO over which the value is calculated, whether or not to adjust the initial return for market movements and which aftermarket stock price quote to use in the return calculation. A large body of previous research do however measure the degree of initial return relative to the offer price of the IPO (Schöber, 2008). In general, earlier studies tend to be characterised by longer periods following the IPO over which the initial return is calculated. In more recent studies, however, the initial return is usually defined as the first-day return (Schöber, 2008).

Beatty and Ritter (1986) argue that there is no need to adjust the initial return for market movements, as these are very small compared to the average initial return. The average first-day return of their second period subsample of IPOs amounted to 14.1%, while the S&P 500 average daily return reached only 0.1%. According to Schöber (2008) the majority of research on initial returns of BO-backed IPOs does not adjust the initial return for market movements following the same reasoning that was proposed by Beatty & Ritter (1986).

Ritter & Welch (2002) state that the vast majority of empirical research has used the closing price of the first-day of trading as a mean of measuring initial return. Several of the more recent studies employ this method (Lowry & Schwert, 2002; Loughran & Ritter, 2004, Otchere et al., 2013), while some earlier studies used the closing bid price (Ritter, 1984; Beatty & Ritter, 1986). Guided by the majority of the most recent research on the topic, the initial return, the degree of potential underpricing, in this paper is defined as the difference between the offer price and the first-day closing price relative to the offer price and will henceforth be referred to as the first-day return. The measure is calculated as follows:

$$R_i = \frac{P_{i,1} - P_{i,0}}{P_{i,0}}$$

where R_i is the first-day return of IPO firm i , $P_{i,1}$ is the first day closing price of IPO firm i and $P_{i,0}$ is the offer price of IPO firm i .

Of the sample we create four different groups (g), one including all the IPOs and the other three restricted to IPOs that are NS, VC-backed or BO-backed respectively. We also create three different market periods (a), one stretching our entire period from 1997-2010, and the other two includes certain years defined as High, and Medium/Low depending on IPO activity. These periods are defined in section 4.2.2 below. The first-day return is calculated individually for all the companies and then the average first-day return for the different groups and market periods is first calculated on an equal weighted (ew) basis according to the following formula:

$$R_{g,a}^{ew} = \frac{1}{n_{g,a}} \sum_{i=1}^{n_{g,a}} R_i$$

where $n_{g,a}$ is the total number of observations in each sample group offered in a given market period and $R_{g,a}^{ew}$ is the equal weighted average first-day return for group g in IPO market period a .

In order to capture the effect of potential underpricing between IPOs of companies of different sizes, the average first-day return of the groups are also calculated on a value weighted (vw) basis. Weights are assigned to the IPO stocks in proportion to their relative inflation adjusted market capitalisation³, at time of their offering, in their respective group and market period. The weights are based on inflation adjusted market capitalisations as the IPOs occur in different time periods. The calculations are presented in the equations below:

$$w_i^{g,a} = \frac{mc_{i,0}}{\sum_{i=1}^{n_{g,a}} mc_{i,0}}$$

$$R_{g,a}^{vw} = \sum_{i=1}^{n_{g,a}} w_i^{g,a} * IR_i$$

where $w_i^{g,a}$ is the value weight for IPO firm i in group g offered in market period a , mc_i is the inflation adjusted market capitalisation of IPO firm i at time of the offering, 0, and $R_{g,a}^{vw}$ is the value-weighted average first-day return for group g in market period a . Each equal-weighted and value-weighted average are then tested to verify that they are statistically different from zero. This testing procedure is described further in section 4.3 below.

³The procedure of calculating inflation adjusted market capitalisations is described in section 5.1

4.2 Aftermarket performance measurement

As touched upon in Section 2, previous research has recognised several different methods to study aftermarket performance, yet there is no consensus on a preferred one. Due to the existence of several abnormal return metrics, benchmarks, time regimes and test statistics, we perform several combinations of these to answer our research question and test our aftermarket performance hypotheses. Bergström et al. (2006) state that academic literature mainly employs periods of either three or five years when measuring aftermarket performance of IPOs. We choose to measure the abnormal returns over three years to enable the use of a more recent sample covering a longer time period. For both abnormal return metrics employed in this paper, we exclude the first month of trading as this month may be affected by price stabilisation efforts by the underwriter (Aggarwal, 2000). This often includes an overallotment option exercisable 30 calendar days after the IPO. Aggarwal (2000) finds that these aftermarket activities have a pronounced effect on the IPO price behaviour and should be considered when studying aftermarket performance. The following sections describe the rest of our aftermarket performance measurement approach and how we address the various issues related to this.

4.2.1 Time regimes

Fama (1998) highlights that there are two different approaches to measuring abnormal returns when it comes to the choice of time regime, event time and calendar time. In the event time approach, calendar dates are irrelevant. The method involves specifying an event time called the event window, which in our study is set to three years, or 36 months. We do however also look at the periods of 6 months, 12 months and 24 months in order to better understand the pattern of IPO aftermarket performance. The IPO is regarded as the event where the first-day of trading is seen as event day one. Since we, however, use monthly returns and exclude the first month of trading, our first event month begins exactly one month after the IPO date and continues trading until the end of event month 36, if the firm is not delisted during the period. The event time approach allows us to compare all the IPOs over our time period regardless of if the IPO date was in 1997 or 2010. For each event month an average across all the sample firms is calculated, hence the method implicitly assumes that the returns of different IPO firms are independent.

Even though the event time approach is widely used, several researchers argue that there is a cross-sectional dependence among the observations (Schultz, 2003; Mitchell & Stafford, 2000; Gompers & Lerner, 2003). IPO firms tend to cluster in times of high markets leading to returns being considerably overlapping, thus creating more cross-sectional dependence. For example, as returns are either accumulated or compounded, one year of extremely negative returns severely

affect the total abnormal return over a longer period in event time. Using the calendar time approach, which bundles the returns of the IPOs in calendar time independently of age, can mitigate the cross-sectional dependence. For any given year, all firms that were floated within the three previous years are considered IPO firms, for example the annual abnormal return for 2002 include IPOs that were floated in 1999 but also in 2001. Since we use monthly return measures, we rebalance the portfolio every calendar month, adjusting the weights for IPO firms entering and leaving the sample. After 36 months, the firm is excluded from the calendar time return, as it is no longer considered an IPO firm. In sum, event time allows a comparison between IPO firms at different IPO dates, whereas the calendar time approach mainly is used to detect variation of abnormal returns across years (Bergström et al., 2006). Due to their different explanatory factors, we choose to use both time regimes.

4.2.2 Abnormal return metrics in event time

In their review of abnormal return metrics Barber & Lyon (1997) note that the conventional method of calculating abnormal returns that have been utilized by many researchers is cumulative abnormal return (CAR). The authors, however, favour the use of an alternative calculation method called buy-and-hold abnormal return (BHAR) on conceptual grounds as it better captures investor experience. Since then, many researchers have discussed the disadvantages and advantages BHAR and CAR and as of yet there is no universally preferred method (Schöber, 2008). A major advantage of CARs over BHARs is that their distributional properties are better understood enabling more reliable statistical tests of abnormality (Schöber, 2008). The CARs are, however, positively biased in the existence of a bid-ask spread in the closing prices (Kothari & Warner, 1997). BHARs are often preferred over CARs as it measures the abnormal returns earned by investors, who follow a buy and hold strategy (Schöber, 2008). A drawback noted by Kothari & Warner (1997) is that BHARs are generally more skewed than CARs, due to the extreme results that may arise from compounding. Brav, Geczy & Gompers (2000) highlight that different choice regarding abnormal performance metric may influence the magnitude of abnormal performance as well as the size and power of statistical tests and ultimately lead to different conclusions. Previous studies have nevertheless mainly employed either one of these two methods or both (Bergström et al., 2006). Following this, we have chosen to utilise both methods to measure long-term performance of our sample in an attempt to increase the validity of our results.

In the CAR method, abnormal returns are calculated for each IPO firm in each month by subtracting the monthly return of a benchmark from the monthly return of each IPO firm. The

abnormal returns are then summed over different time periods to get the cumulative abnormal return of each IPO firm. The BHAR method compares the compounded return of each IPO firm over a time period to the compounded return of a benchmark over the same period to get the abnormal return over the period. We calculate the returns of the IPO and the benchmarks using total return indices to get a more accurate view of the IPO performance. If a firm is delisted prior to three year holding period, we truncate its abnormal return on the last monthly observation prior to delisting for both methods, similar to Ritter (1991) and Brav & Gompers (1997). The calculations are performed as follows:

$$R_t^i = \frac{TRI_t^i - TRI_{t-1}^i}{TRI_{t-1}^i}$$

$$R_t^{i,b} = \frac{TRI_t^{i,b} - TRI_{t-1}^{i,b}}{TRI_{t-1}^{i,b}}$$

where R_t^i is the return of IPO firm i in event month t , TRI_t^i is the total return index of IPO firm i in event month t , TRI_{t-1}^i is the total return index of IPO firm i in event month $t-1$, $R_t^{i,b}$ is the return of benchmark b for IPO firm i in event month t , TRI_t^b is the total return index of benchmark b for IPO firm i in event month t , TRI_{t-1}^b is the total return index of benchmark b for IPO firm i in event month $t-1$.

$$CAR_T^i = \sum_{t=1}^T (R_t^i - R_t^{i,b})$$

$$BHAR_T^i = \prod_{t=1}^T (1 + R_t^i) - \prod_{t=1}^T (1 + R_t^{i,b})$$

Where CAR_T^i is the cumulative abnormal return for IPO firm i over event time period T and $BHAR_T^i$ is the buy-and-hold abnormal return of IPO firm i over event time period T . The equal-weighted (ew) average CAR and BHAR for the different groups, defined in the initial return section above, and market periods, defined in section 4.2.2, are calculated according to the equations below:

$$\overline{CAR}_{g,a,T}^{ew} = \frac{1}{n_{g,a}} \sum_{i=1}^{n_{g,a}} CAR_T^i$$

$$\overline{BHAR}_{g,a,T}^{ew} = \frac{1}{n_{g,a}} \sum_{i=1}^{n_{g,a}} BHAR_T^i$$

where $n_{g,a}$ is the number of observations in each sample group and market period and $\overline{CAR}_{g,a,T}^{ew}$ and $\overline{BHAR}_{g,a,T}^{ew}$ are the equal-weighted average CAR and BHAR for sample group g in market period a over event time period T respectively.

We also calculate the value-weighted average CAR and BHAR in event time for the different time periods. The weights are based on each IPO firm's inflation-adjusted market capitalisation at the start of the aftermarket performance calculation, one month after the date of each IPO, in relation to the total inflation-adjusted market capitalisation of the different groups. The calculations are executed in the following manner:

$$w_{g,a}^i = \frac{mc_{i,1}}{\sum_{i=1}^{n_{g,a}} mc_{i,1}}$$

$$\overline{CAR}_{g,a,T}^{vw} = \sum_{i=1}^{n_{g,a}} w_{g,a}^i * CAR_T^i$$

$$\overline{BHAR}_{g,a,T}^{vw} = \sum_{i=1}^{n_{g,a}} w_{g,a}^i * BHAR_T^i$$

where $w_{g,a}^i$ is the value weight for IPO firm i in group g in market period a , $mc_{i,1}$ is the inflation adjusted market capitalization of IPO firm i at one month after the IPO, 1, and $\overline{CAR}_{g,a,T}^{vw}$ and $\overline{BHAR}_{g,a,T}^{vw}$ are the value-weighted average CAR and BHAR for sample group g in market period a over event time period T respectively. Finally, the medians for the different event time periods T of CAR_T^i and $BHAR_T^i$ are retrieved for each sample group and market period.

4.2.3 Abnormal return metrics in calendar time

In the calendar time approach we begin by calculating 36 monthly aftermarket returns for all IPOs in our sample starting from the last trading day in the month after the IPO. For each calendar month, we create portfolios of IPO firms by our sample groups over which equal-weighted and value-weighted returns are measured. A firm is classified as an IPO firm in a given calendar month if it entered its aftermarket performance measurement period within the preceding 36 calendar months. As we calculate monthly observations by the end of each month

and wish to exclude the first month of trading, an IPO firm will enter the aftermarket performance period in the last calendar date in the month following its IPO. These calculations are performed as follows:

$$R_{ct}^i = \frac{TRI_{ct}^i - TRI_{ct-1}^i}{TRI_{ct-1}^i}$$

where R_{ct}^i is the return of IPO firm i , in calendar month ct , TRI_{ct}^i is the total return index of IPO firm i in calendar month ct , TRI_{ct-1}^i is the total return index of IPO firm i in calendar month ct .

$$\begin{aligned} \bar{R}_{p,ct}^{ew} &= \frac{1}{n_{p,ct}} \sum_{i=1}^{n_{p,ct}} R_{ct}^i \\ w_{p,ct}^i &= \frac{mc_{i,ct-1}}{\sum_{i=1}^{n_p} mc_{i,ct-1}} \\ \bar{R}_{p,ct}^{vw} &= \sum_{i=1}^{n_{p,ct}} w_{p,ct}^i * R_{ct}^i \end{aligned}$$

where $\bar{R}_{p,ct}^{ew}$ is the equal-weighted return of portfolio p in calendar month ct , $n_{p,ct}$ is the number of observations in portfolio p in calendar month ct , $w_{p,ct}^i$ is the value weight for IPO firm i in portfolio p in calendar month ct , $mc_{i,ct-1}$ is the market capitalisation of IPO firm i in calendar month $ct-1$ and $\bar{R}_{p,ct}^{vw}$ is the value-weighted return of portfolio p in calendar month ct . Monthly observations are also calculated for the benchmarks. The value-weighted and equal-weighted returns of the portfolios are compounded along with the monthly benchmark observations from January to December for each calendar year to get yearly calendar observations. The yearly return of the benchmark is then subtracted from the yearly equal-weighted and value-weighted portfolio returns to get the yearly abnormal calendar time returns. The calculations are performed as follows:

$$R_{ct}^{p,b} = \frac{TRI_{ct}^{p,b} - TRI_{ct-1}^{p,b}}{TRI_{ct-1}^b}$$

$$AR_Y^{ew} = \prod_{ct=jan}^Y (1 + \bar{R}_{p,ct}^{ew}) - \prod_{ct=jan}^Y (1 + R_{ct}^{p,b})$$

$$AR_Y^{vw} = \prod_{ct=jan}^Y (1 + \bar{R}_{p,ct}^{vw}) - \prod_{ct=jan}^Y (1 + R_{ct}^{p,b})$$

where $R_{ct}^{p,b}$ is the return of benchmark b for portfolio p in calendar month ct. $TRI_{ct}^{p,b}$ is the total return index, of benchmark b for portfolio p in calendar month ct and $TRI_{ct-1}^{p,b}$ is the total return index, of benchmark b for portfolio p in calendar month ct-1. AR_Y^{ew} is yearly abnormal compounded equal-weighted portfolio return in year Y and AR_Y^{vw} is yearly abnormal compounded value-weighted portfolio return in year Y.

4.2.4 Market period definition

To examine whether the sub groups' long-term performance are affected by when they decide to go public and if there is any difference among the groups, we label each year as high, medium or low based on the level of IPO activity as suggested by Schöber (2008). By using all IPOs derived from Zephyr (574), we define years with a number of IPOs below the 25th percentile value (above the 75th percentile value) of all the number of IPOs as low (high) IPO activity. The remaining years are labelled medium IPO activity. Following this approach, the years 2001-2003 experienced low IPO activity whereas the IPO activity noted high levels in 2005-2007. Our sample firms are defined as high or medium/low IPO firms on the basis of which year they went public and the IPO activity level in that year. We combine the IPOs listed in the medium and low period into one group as we are interested in how the high period differs from the rest on an overall basis. This division also facilitates the upcoming statistical tests.

4.2.5 Benchmarks

Bergström et al. (2006) argue that “benchmarks ideally have the same exposure to fundamental risks as IPO firms and also capture their risk characteristics so that the risks determining expected returns are matched” (p. 21). Previous research contends that there are two types of benchmarks dominating the aftermarket performance studies. The first is a broad equity market index, like for instance the MSCI Nordic Index, and the second involves benchmarking raw returns against comparable firms with similar risk characteristics. The latter approach can either be an individual comparable firm or a portfolio of several matched firms (Schöber, 2008). The use of market indices as benchmarks are widely employed in the previous literature (e.g. Brav & Gompers, 1997; van Frederikslust & van der Geest, 1999; Bergström et al., 2006; Cao & Lerner 2009), and has the advantage of being easily implemented and fruitful for evaluating active

investment strategies (Bergström et al., 2006; Schöber, 2008). The drawback of using broad equity indices is, however, that it does not reflect the unique characteristics of the IPO firm. Researchers have therefore come to complement the equity indices with benchmarks based on comparable firms (e.g. Ritter, 1991; Loughran & Ritter, 1995; Fama & French, 1992; Lyon, Barber & Tsai, 1999; Levis, 2011). Ever since Banz (1981) found that small stocks in general have higher average returns than predicted by the CAPM and Fama & French (1992) showed that the average stock return is also related to book-to-market equity, it has become common to create benchmarks on the basis of size and book-to-market ratios (Fama, 1998; Schöber, 2008). Due to the relative strength of both types of benchmarks and their complementary nature, this study will use both an equity index to track the development of the stock market and portfolio of several matched firms to incorporate risk characteristics as different size and book-to-market ratios.

To study aftermarket performance, BHAR and CAR are calculated using two benchmarks, MSCI Nordic Index and a self-constructed portfolio benchmark. The latter matches the individual characteristics, size and book-to-market ratios, of the IPO firm to a portfolio of firms with similar characteristics. Following Levis (2011) we create six benchmarks with different risk characteristics. We form our self-constructed size and book-to-market benchmark (henceforth SBM) by grouping all firms trading on any of the Nordic stock exchanges in six portfolios based on size and book-to-market ratio. First, we split all benchmark firms into two portfolios based on the size of their market capitalization at the beginning of each year and secondly, each of the two portfolios are sorted into three book-to-market portfolios. As suggested by Fama & French (1993) the median market capitalisation is used as a cut-off point for the sorting on size, the 30th and 70th percentile of book to market are used as cut-off points for the sorting on this ratio and the portfolios are rebalanced yearly. The IPOs in our sample are then matched to one of the six portfolio benchmarks based on market capitalisation and book-to market ratio at the start of their aftermarket performance measurement period.

4.2.6 An example of event time vs. calendar time

A comparison between event time approach and calendar time approach is illustrated in table 1⁴. The example uses a period of five years where six firms are floated and the event window is set to three years. The period over the years 0-1 experience increases in stock prices of +10% when the market increases with +2%. The high valuations trigger four IPOs in year 2 when prices are

⁴ The example is taken from a master thesis by Björcke & Menzel (2006)

peaking. The following years are experiencing a recession with falling stock prices of -10% and corresponding market movements of -2%. Yearly equal-weighted calendar time abnormal return (YCTAR) are +8% in Year 0-1 and -8% Year 2-5 leading to an average yearly calendar time return of -1.6% equivalent to a three year return of -4.8%. Correspondingly, the event time return is calculated as the average of the sum of each firm's abnormal return over the event window amounting to -16%. The example firms that go public in the high volume years, 0-1, will underperform resulting in an average underperformance for the total sample in event time. This phenomenon is what Schultz (2003) refers to as pseudo market timing and can be mitigated by measuring returns in calendar time.

Table 1 - Comparison between Event time and Calendar time approaches

Year	0	1	2	3	4	5
Firm I	100	110.0	121.0	108.9		
Firm II		100.0	110.0	99.0	89.1	
Firm III			100.0	90.0	81.0	72.9
Firm IV			100.0	90.0	81.0	72.9
Firm V			100.0	90.0	81.0	72.9
Firm VI			100.0	90.0	81.0	72.9
Market	100.0	102.0	104.0	102.0	99.9	97.9
Abnormal Return, Firm I		8.0%	8.0%	-8.0%		
Abnormal Return, Firm II			8.0%	-8.0%	-8.0%	
Abnormal Return, Firm III				-8.0%	-8.0%	-8.0%
Abnormal Return, Firm IV				-8.0%	-8.0%	-8.0%
Abnormal Return, Firm V				-8.0%	-8.0%	-8.0%
Abnormal Return, Firm VI				-8.0%	-8.0%	-8.0%
YCTAR		8.0%	8.0%	-8.0%	-8.0%	-8.0%
Calendar-time, average YCTAR						-1.6%
Calendar-time three year						-4.8%
Event-time three year						-16.0%

4.3 Test statistics

To statistically verify our hypotheses about the first-day return and aftermarket performance of our Nordic sample we employ a number of tests on our calculated performance metrics. These are described in detail in the remainder of this section.

In order to test the prevalence of underpricing in our IPO sample groups, hypotheses I(a), a two sided t-test is employed to test whether the first-day returns for the different groups in all market

periods are different from zero. Two-sided t-tests are also used in the attempts to verify hypothesis I(b), that BO-backed IPOs are less underpriced than the other groups and II(a), if our sample experiences higher underpricing in high IPO activity market periods. To see if the data supports I(b), we test whether the difference between the equal-weighted average first-day return of BO-backed and NS IPOs as well as that of BO-backed and VC-backed IPOs are statistically different from zero. Similarly, to verify hypothesis II(b) we test, for each subgroup of IPOs, whether the difference between the average first-day returns in the high period are statistically different from those in the medium/low period. To test whether the data supports our final first-day return hypothesis, II(b), we employ an approach where we regress the first-day returns for each subgroup on a dummy variable that takes on the value 1 in high market periods and 0 in medium/low periods. The estimated coefficient for the dummy variable will then represent the change in average first-day return between the high and medium/low period for each respective group. To test whether the change in average first day return of BO-backed IPOs is different from that of VC and NS, we combine the regressions that estimated the change in average first-day return for the two combinations of groups, BO vs NS and BO vs VC. We then test whether the estimated coefficients for the dummy variables representing the average change in each subgroup between the high and medium/low market period are different

To determine whether Nordic IPOs are underperforming in the aftermarket, hypotheses III(a), we test if the abnormal return metrics are significantly different from zero. One alternative is to employ the Student's t-test, a parametric test, which requires the abnormal returns should follow a normal distribution. By plotting the abnormal returns for our different methods (see Section 6.2.1), we conclude that the returns are skewed. As the methods we use either accumulate or compound the abnormal returns over a longer time horizon, there is a potential for cross-sectional dependence between the IPO firms. If this cross-sectional dependence is positive, Cowan & Sergeant (2000) argue that conventional statistical test does not handle this in a good way. Due to these characteristics, we deem a non-parametric test as Wilcoxon signed-rank test, which does not assume normal distribution, more suitable. Additionally, Barber & Lyon (1996, 1997) emphasise that the Wilcoxon signed-rank test is superior in case of the existence of extreme outliers. As we calculate BHAR, which produces extreme values as seen in Figure 1, we find further support of our choice of statistical test. The Wilcoxon signed-rank test tests the null hypothesis that the median abnormal return is equal to zero. In addition, we wish to test if there is any difference in abnormal returns between the subgroups, and especially if BO-backed IPOs are underperforming less than other IPOs, hypotheses III(b). Following the argumentation

above we will employ Mann-Whitney U-test which is similar to the Wilcoxon sign-rank test but compares medians between two groups. Mann-Whitney U-test will also be used for testing that all subgroups of IPOs are experiencing worse performance if floated in high volume market periods, hypotheses III(a).

To test whether the data supports our final first-day return hypothesis, III(b), we employ the same approach as in the hypothesis II(b) testing. We regress the 36 month BHAR for each subgroup on a dummy variable that takes on the value 1 in high market periods and 0 in medium/low periods. The estimated coefficient for the dummy variable will then represent the change in equal-weighted average 36 month BHAR between the high and medium/low period for each respective group. To test whether the change in average 36 month BHAR of BO-backed IPOs is different from that of VC and NS, we combine the regressions that estimated the change in average 36 month BHAR for the two combinations of groups, BO vs NS and BO vs VC. We then test whether the estimated coefficients for the dummy variables representing the average change in each subgroup between the high and medium/low market period are equal. A summary of the hypotheses and respective test statistics are found in the table 16.

5 Data

5.1 Sample identification and supplemental data

The selection of companies in our study involves identifying an initial dataset, classifying IPO firms into one of the subgroups of IPOs and finally collecting data on stock returns and company financials to test for first-day returns and aftermarket performance.

To capture both periods of booming markets as well as periods of recessions, this study focuses on IPOs floated in the period between January 1997 and December 2010. To capture the entire Nordic IPO market, we include all stock exchanges on the Nordic markets e.g. Nasdaq OMX Stockholm, Aktietorget, NGM, Oslo Bors, Oslo Axess, Nasdaq OMX Copenhagen, Nasdaq OMX Helsinki. Based on our chosen time period and geographical scope, our initial sample of 574 IPOs is collected from the financial database Zephyr and excludes secondary listings. Additionally, to avoid survivorship bias we include companies delisted during our measurement period of 36 months.

In order to answer our research questions and study first-day return and aftermarket performance between different types of IPOs, we need to classify the IPOs into three subgroups based on the characteristics of the ownership structure at time of the IPO. As noted, we distinguish between BO-backed IPOs, VC-backed IPOs and NS IPOs. Many researchers have argued that the distinction between BO and VC firms is often ambiguous due to the combined effect of limited publicly available information and the fact that BO and VC funds involvement in portfolio companies are of overlapping nature (Levis, 2011). While Zephyr offers classifications of BO and VC-backed IPOs, we note that these are inconsistent and sometimes incorrect when comparing with our own definitions. Following this we have decided to disregard them and manually classify our sample firms into one of the subgroups. By examining several different sources such as prospectuses, stock exchange publications, financial newspapers and data from Zephyr, we collect information about the shareholders of the floated firm prior to the IPO. To determine whether the shareholders are either a BO firms or VC firms, we rely on the membership lists and classifications provided by the Swedish (SVCA), Norwegian (NVCA), Danish (DVCA) and Finnish (FVCA) Venture Capital Associations. Additionally, we cross check all the members of the Venture Capital Association's homepages and add missing BO and VC-backed IPOs manually. Companies for which we have not been able to classify or find identification number e.g. ISIN or SEDOL code are excluded from the sample, accounting for approximately 19% of the initial data set. A table detailing the reasons for excluding IPO firms from our initial dataset are found in Appendix 1.

We use Datastream to collect daily data on share price, measured in terms of total return index, and inflation adjusted market values the three consecutive years after the IPOs, hence our data extends to beginning of 2014. The total return index is considered better to use than price data since it adjusts for dividends being reinvested, thus is more suitable for investigating a company's performance from an investor's perspective. To get inflation adjusted market values, we collect market values and Consumer Price Index for the Swedish market, as a Nordic index is not available, from Datastream. Using 1997 as a base year, we calculate inflation adjusted market values expressed in 1997 years' prices. Even though we are measuring returns on a monthly basis, the data is collected on a daily basis to be able to incorporate that the IPO firms went public on different dates. The monthly returns are calculated as change in the index from the month before. To control for the different currencies on the Nordic markets, market values are obtained in Euros. Datastream lack share prices for approximately 3% of our initial data set, hence they are excluded from the sample. Further, we control for consistency of IPO dates

between data collected from Zephyr and Datastream, and in case of divergence we validate the IPO date by looking at prospectus and press releases. After all adjustments, the final data set comprises 443 IPOs floated on any of the Nordic stock exchanges between January 1997 and December 2010. A detailed list of our final sample is presented in the Appendix 3.

In order to test for first-day returns, we need to collect offer prices and closing prices for the first-day of listing, which are collected from Datastream. Since no single source provides us with offer prices for all our sample firms, we use a combination of data from Bloomberg, SDC Platinum and Zephyr, which both complement each other and confirm the reliability of the offering prices. Unfortunately, we only find offer prices for 58% of our entire sample, illustrated in Appendix 2. Over time, we are able to find more offering prices. This is likely due to the emergence of electronic databases and the increased documentation over time. We find 75% of all BO-backed IPOs, 73% of all VC-backed IPOs and 52% of all NS IPOs.

Datastream also provides us with total return figures and market values for our benchmark firms. Additionally, due to lack of book-to-market ratios we use price-to-book ratios from Datastream, which we invert to be able to sort the benchmark firms into three groups. For firms missing price-to-book data, we manually calculate book-to-market ratios with equity values provided by Compustat. The firms for which Compustat lacks equity values are excluded from the sample. The final benchmark sample consists of 788 firms. MSCI Nordic Index is collected in total return figures from Datastream.

5.2 Data collection criticism

Even though we consider our sample selection process exhaustive and have undertaken extensive verification efforts, we are aware of the fact that our dataset may suffer from some deficiencies. A detailed discussion of our main concerns is laid out below.

Firstly, our sample of IPO firms may be incomplete. Due to limited access to other databases containing information about IPOs like Deallogic, we rely on Bureau van Dijk's database Zephyr. When crosschecking with external sources like homepages of BO private equity firms, we find a few IPOs that are not included in the initial sample collected from Zephyr. To mitigate the incompleteness of our sample, we complement the initial dataset and identification of shareholders prior the IPO with a bottom-up approach. This involves examining the homepages of VCs and BOs listed on any of the Nordic Venture Capital Associations for IPO exits and adding the IPOs missing in our initial dataset.

The second criticism against our data is erroneous classification of IPOs to one of the subgroup. This problem mainly arises either due to difficulties of finding complete information about shareholder structure prior to the IPO or due to the vague distinction between VC and BO. To minimize the former, we primarily try to find the IPO prospectus, as this is the most complete source of information, and if not available we have to rely on information on company homepages and in press articles. The second source of potential shortcomings of our sample is wrongly classifying VC as BO, or vice versa. This shortcoming could distort our analysis and potentially lead to a bias as VC-backed IPO has historically demonstrated a different performance pattern than BO-backed IPOs in studies conducted on other markets. To minimize the issue, we rely on the member classifications made by any of the Nordic Venture Capital Associations. It seems likely that the degree of misclassification of our sample decreases over time due to both increased publication of IPO prospectuses and greater transparency of private equity BO firms in more recent years.

Finally, a potential criticism to our self-constructed benchmark, SBM, is that it may suffer from survivorship bias. The benchmark contains all firms currently listed on any of the Nordic stock exchanges. Hence, firms that have been delisted during our time period are excluded from the benchmark. Due to technical restrictions of retrieving delisted firms for the Nordic stock market lists from Datastream, we did not manage to mitigate the survivorship bias. Excluding delisted firms commonly leads to an upward bias in the returns (Bilo et al., 2005). This in turn may depress the abnormal returns as the returns of the benchmark are overstated. Bilo et al. (2005) have examined the previous research on the topic of survivorship bias, mostly examining how it affects the mutual fund performance. They find that the bias accounts for 0.1% to 1.5% of the annualized returns. The degree of bias is somewhat dependent upon the instrument and time period. As the bias is relatively small, we do not believe that it will have any substantial effect on our results.

6 Results and Analysis

6.1 Descriptive statistics

Table 2 presents the annual number of IPOs and average first-day market capitalisation of these for the entire sample (ALL) and the different IPO types (NS, VC and BO) respectively. 320 (72%) of our IPOs are NS, 70 (16%) IPOs are VC-backed and 53 (12%) are BO-backed. 55 IPO

firms or 12% of our sample are delisted within three years after the IPO. Some previous research on IPOs notes a dramatic rise in IPO activity to high levels in the years around 2000, when the stock market was peaking, before drastically dropping in subsequent years as market conditions worsened (Bergström et al., 2006; Levis, 2011). The increase in IPOs around the new millennium is not as apparent in our total sample, although VC-backed IPOs reached a high in the year of 2000. This may be explained by the fact that many information technology firms with VC-investments went public in that year. Following a period of low activity, markets were stimulated with low interest rates and a high IPO activity period is registered in 2005-2007, the years preceding the financial crisis. These boom years exhibit volume increases for all different types of IPOs and almost half of our BO sample is issued in this period. In 2008-2009 the IPO activity go down by a substantial amount, most likely a result of the events leading up to and surrounding the financial crisis. No BO-backed IPOs are floated in these years. In 2010, the amount of IPOs more than doubled from 2009, but still fell far short of the peak year of 2007.

Table 2 - Annual Distribution of IPOs by Number and Average Market Capitalisation

Year	Number				Average Market Cap (EURm)			
	ALL	NS	VC	BO	ALL	NS	VC	BO
1997	17	13	2	2	95	102	101	43
1998	23	13	4	6	248	367	65	112
1999	25	17	3	5	164	158	98	223
2000	29	14	13	2	1916	3155	499	2462
2001	14	8	3	3	1544	2625	87	119
2002	7	1	2	4	304	12	28	515
2003	5	4	1	0	43	36	67	0
2004	29	23	4	2	160	171	46	252
2005	60	43	8	9	201	223	104	179
2006	59	43	9	7	338	209	869	452
2007	71	53	9	9	157	111	169	415
2008	40	36	4	0	54	58	22	0
2009	20	18	2	0	77	31	491	0
2010	44	34	6	4	356	261	89	1565
Total	443	320	70	53	357	356	280	462

The total sample of 443 IPOs is comprised of 320 non-sponsored (NS), 70 venture-capital-backed (VC), and 53 buyout-backed (BO) IPOs from January 1997 to December 2010 listed on any of the Nordic stock exchanges. Average market capitalisation is the first-day closing price times the corresponding number of share outstanding.

BO-backed IPOs are, on average, larger companies in terms of market capitalisation⁵ (462 EURm) than their VC-backed (280 EURm) and NS (356 EURm) counterparts. In 2000 and 2001, the subgroup NS reach a high mainly attributable to a few very large IPOs namely Telia, Telenor and Statoil accounting for 36% of the average first-day market capitalisation.

Table 3 - Percent of IPOs by IPO activity period and Subgroup

IPO activity period	Distribution of IPOs (%)				Average infl. adj. market cap (EURm)			
	ALL	NS	VC	BO	ALL	NS	VC	BO
High	43	43	37	47	202.3	156.9	349.3	302.1
Medium/Low	57	57	63	53	202.7	152.3	203.4	522.2
Total	100	100	100	100	202.6	154.3	257.6	418.4

The total sample of 443 IPOs is comprised of 320 non-sponsored (NS), 70 venture-capital-backed (VC), and 53 buyout-backed (BO) IPOs from January 1997 to December 2010 listed on any of the Nordic stock exchanges. Firms are grouped by IPO activity period and the distribution of IPOs, in percent, is presented. The high IPO activity period extends between 2005-2007 and the remaining years are classified as medium/low IPO activity. Average inflation adjusted market capitalisation (EURm) at first-day closing is expressed in 1997's prices and are excluding Telia, Telenor and Statoil, which are considered extreme outliers.

Table 3 demonstrates the percentage distribution of IPOs and shows that BO-backed IPOs in our sample are relatively more common in periods of high IPO activity, than their VC-backed and NS counterparts. This finding is also demonstrated by Schöber (2008) on the US market, but stands in contrast to Bergström et al. (2006) who demonstrated the opposite at the Paris Stock Exchange and London Stock Exchange. Correspondingly, BO-backed IPOs are less represented in medium/low market periods than VC-backed and NS ones. As can be seen in table 3, the data for the entire sample of IPOs (ALL) only reveals a small difference in size, measured as average inflation adjusted market capitalisation⁶, between the IPO activity periods. While NS IPOs exhibit a similar pattern, VC- and BO-backed IPOs demonstrate substantial differences between the size of the floated firms in the different periods. VC-backed IPOs in high issue periods are, on average, larger companies (349.3 EURm) than those floated in medium/low volume periods (203.4 EURm). For BO-backed IPOs, on the other hand, the sample demonstrates that larger firms are floated in medium/low market activity. This pattern is largely attributable to the IPO of Pandora in 2010, which is by far the largest BO-backed IPO in our sample. Even if we adjust for this outlier though, the pattern remains the same with medium/low period experiencing around 33% larger firms.

⁵ Ideally we would like to measure the market capitalisation at time of offering calculated using the offer prices times the number of shares outstanding, but due to not retrieving offer prices for our full sample we decided to use first-day market capitalisations

⁶ Excluding the extreme outliers Telia, Telenor and Statoil, all of which are non-sponsored

Table 4 illustrates the sample distribution per geography. The Swedish market has experienced the largest number of total IPOs (57%) followed by Norway (28%), Denmark (9%) and Finland (6%). A similar pattern is observed in the subgroups where Sweden and Norway together account for 87% of the NS IPOs, 83 % of the VC IPOs and 79% of the BO-backed IPOs. Also illustrated in table 4 is the distribution of IPOs, for which offer prices could be attained. Although the observations in the first-day return analysis are fewer than in our total sample, the distributional pattern remains similar between countries and groups remains similar.

Table 4 - Number of IPOs per country

Country	Aftermarket Performance				First-day returns			
	ALL	NS	VC	BO	ALL	NS	VC	BO
Sweden	252	195	33	24	132	94	20	18
Denmark	40	27	8	5	30	21	6	3
Norway	125	82	25	18	79	43	21	15
Finland	26	16	4	6	15	8	3	4
Total	443	320	70	53	256	166	50	40

The total sample of 443 IPOs is comprised of 320 non-sponsored (NS), 70 venture-capital-backed (VC), and 53 buyout-backed (BO) IPOs from January 1997 to December 2010 listed on any of the Nordic stock exchanges. Due to difficulties in attaining offer prices, sample for the first-day return analysis is comprised of 256 firms where 166 are NS, 50 are VC-backed and 40 are BO-backed.

6.2 First-day returns

Table 5 presents the results from the first-day returns calculations for the entire sample and the different subgroups respectively. It also shows the results for all the groups by type of market period.

Table 5 - First-day returns by subgroup of IPO and IPO activity period

	ALL	NS	VC	BO
Average (equal-weighted) (%)	8.43****	8.78***	9.37****	6.00****
Average (value-weighted) (%)	6.64****	3.39****	20.64****	10.44****
High period average (equal-weighted) (%)	11.10****	12.95****	8.86***	7.63***
Medium/Low period average (equal-weighted) (%)	6.32***	5.73**	9.72*	3.55
Observations	256	166	50	40

The sample of 256 IPOs, for which offer prices could be attained, is comprised of 166 non-sponsored (NS), 50 venture-capital-backed (VC), and 40 buyout-backed (BO) IPOs from January 1997 to December 2010 listed on any of the Nordic stock exchanges. Value-weights are based on market capitalisation at time of offering. The high IPO activity period extends between 2005-2007 and the remaining years are classified as medium/low IPO activity. The significance levels refers to two-sided t-tests for whether the averages are different from zero, where significance levels of 15 percent (*), 10 percent (**), 5 percent (***) and 1 percent (****) are highlighted.

In line with most previous studies, irrespective of return metric used, the sample has experienced positive first-day returns for all groups over the studied period of 1997 - 2010, implying that all groups, on average, are subject to underpricing. These results are also statistically different from zero at reasonable significance levels, suggesting that hypothesis I(a) is supported by the data. Both the equal-weighted and the value-weighted average first-day return of our entire sample is far below the level of 15-18% that Jenkinson & Ljungqvist (2001) argue most industrialised countries experiences. One potential explanation to the lower underpricing in our Nordic sample could be tied to the theories of asymmetric information. The Nordics are known for their high degree of transparency and easy access to information, two properties that could potentially alleviate the information asymmetry by mitigating the ex-ante uncertainty of investors in this setting. It should be noted that the average equal-weighted return of BO-backed IPOs in our sample is smaller than that of VC-backed and NS. This result does, however, not hold when the first-day returns are value-weighted.

The equal-weighted first-day return of BO-backed IPOs of 6.00% could be contrasted to two previous studies on European markets by Bergström et al. (2006) and Levis (2011), whose samples of BO-backed IPOs experience equal-weighted first-day returns of 9.33% and 9.1% respectively. Their studied time periods are however somewhat different, Levis's sample stretches from 1994-2004 and Bergström et al.'s (2006) range from 1992 – 2005. Their classification of BO IPOs and way of measuring first-day return seem to be fairly consistent with ours though. Nevertheless, the difference is substantial as BO-backed IPOs in the Nordics have experienced less underpricing by over 3 percentage points on an equal-weighted basis compared to these European samples. Putting this in relative terms, BO-backed IPOs in the Nordics have experienced around 1/3 less underpricing. More recent, similar studies on BO-backed IPOs in the US markets by Schöber (2008) and Cao & Lerner (2009) also report equal-weighted returns that are substantially higher than ours, amounting to 9.91% and 12.88% respectively.

In addition to the equal-weighted first-day returns of their entire sample, Bergström et al. (2006) present value-weighted first-day returns for the two subsets of their sample, BO-backed IPOs on the London Stock Exchange and the Paris Stock Exchange, of 7.32% and 7.24%. Levis (2011) and Schöber (2008) find average first-day returns of their BO-backed IPOs, on a value-weighted basis, of 5.7% and 10.19% respectively. As can be seen in table 5, the value-weighted first-day return of BO-backed IPOs in our sample of 10.44% is almost 75% higher than the equal-

weighed equivalent. The value-weighted average of BO-backed IPOs in our sample is however highly affected by the largest transaction in the sample, the IPO of Pandora, which experienced a first-day return of 25.2% and has an inflation adjusted market capitalisation at time of the offering of almost four times the second largest transaction. If one disregards this outlier, the value-weighted average first-day return for BO-backed IPOs amount to 6.68% in our sample, a figure slightly lower than Bergström et al.'s (2006) and significantly lower than that of Schöber (2008), but still somewhat higher than Levis's (2011).

Although the first-day returns of BO-backed IPOs differ somewhat depending on return-metric, the overall picture from the comparisons above is that BO-backed IPOs in the Nordics seem to experience less underpricing. The comparison do however, as touched upon above, suffer from drawbacks, as the compared studies among other things differ in time period studied and exact definitions of what constitutes a BO-backed IPO. Moreover, there is probably other research out there, which if included may result in a different conclusion. A potential explanation to the results could be found in the literature, where some argue that there is a special relationship between underwriters and BO firms as these are lucrative repeat customers of the bank, eliminating the advantage the underwriter usually have in IPO pricing negotiation (Beatty & Ritter, 1986; Mogilevsky & Murgulov, 2012). We propose that this relation may be even more pronounced in the Nordics as the BO industry is one of the region's most important and largest investor groups (Spliid, 2013) and accounts for a large share of some underwriters' business.

Even though the average first-day return of the entire sample is similar on an equal- and value-weighted basis, there are notable differences in the subgroups. On a value-weighted basis, the average first-day return for VC-backed and BO-backed IPOs are larger than their equal-weighted equivalents, implying that the larger firms in the sample are experiencing higher first-day returns. The converse is true for the NS-group of IPOs. The difference in the BO-sample is, as explained above, mainly attributed to the very high first-day return of the largest IPO in the subsample. Similarly, in the VC-group, the three largest IPOs⁷ in the group have very high initial returns, some exceeding the equal-weighted average by a substantial amount. Finally, the value-weighted average in the NS-group is depressed by the low initial return of the IPO of Telia, which is by far the largest IPO in the subgroup as the inflation adjusted market capitalisation at time of offering exceeds the second largest transaction by almost four times. As our sample includes a small

⁷ These are, presented in descending order of size, Renewable Energy Corporation, Stepstone and Satama Interactive

number of IPOs of some very large companies that dominates the sample in terms of relative market capitalisation, the value-weighted averages are heavily affected by the returns of these IPOs. Consequently, only the equal-weighted average first-day returns for the groups by type of market period is presented. Moreover, the tests of the difference in underpricing between BO and the other groups as well as the tests of differences between market periods for each group are performed on the equal-weighted averages.

A slightly different picture to the overall period results emerges when studying the results with regards to the prevailing market period at the time of the IPOs. In the high period, where all the results are statistically different from zero at reasonable significance levels, BO-backed IPOs still have the lowest average return, while that of NS is now larger than the VC-backed. For the medium/low period, the result for the entire sample is positive and statistically different from zero at the 0.01 level. The averages of the subgroups in this period follows the same pattern as that over the entire period, with VC-backed experiencing the highest followed by NS and BO-backed. We can however, only statistically verify that the averages are different from zero for NS and VC at reasonable significance levels. If one instead compares the average first-day returns within each group for different periods, the general trend is that the underpricing becomes larger as IPO activity rises. The only exception is found in the VC-subgroup where underpricing is higher in the medium/low period than in the high period. This general trend is not unique to our sample. Bergström et al. (2006), Cao & Lerner (2009) and Levis (2011) all find that underpricing increases in periods of high market activity, in their samples, a high market period occurred in the years preceding the new millennium.

Table 6 - Tests of differences in the average first-day returns between BO-backed IPOs and the remaining sample

Comparison		Number of Observations	Average (percent)	t-statistic	P(T > t)
BO vs. NS					
	<i>Buyout</i>	40	6.0		
	<i>Non-sponsored</i>	116	8.7		
	diff		-2.7	-0.50	0.61
BO vs. VC					
	<i>Buyout</i>	40	6.0		
	<i>Venture Capital</i>	50	9.4		
	diff		-3.4	-0.73	0.47

The table reports t-test results from the comparison of the average first-day return of BO-backed IPOs to the remaining sample. The significance levels refer to a two-sided t-test of whether the averages of the two sample groups are equal, where significance levels of 15 percent (*), 10 percent (**), 5 percent (***) and 1 percent (****) are highlighted.

As we have seen that the equal-weighted average first-day returns in our sample differs among the different subgroups, with BO being the lowest we proceed, to test if these differences are statistically different from zero. Following our focus on the performance of the BO-backed group of IPOs, we test whether the average equal-weighted first-day return of this group is different from that of NS and VC-backed respectively. The results from these tests are presented in table 6. As expected, the average differences of BO-backed IPOs and the other groups are negative. Unfortunately we cannot say that the differences are statistically different from zero at any reasonable significance level, which implies that the data does not support hypothesis I(b). Even though we cannot statistically verify the difference between the first-day return of BO-backed IPOs and the other groups, we see that the underpricing of BO-backed IPOs is lower than both that of NS and VC-backed IPOs. This is in line with previous findings (e.g. Bergström et al., 2006; Levis, 2011) and could potentially be explained by some combination of the theories of certification, the relationship with the underwriter and the fraction of institutional investors.

Table 7 - T-tests of differences in average first-day returns between high and medium/low period for each subgroup

Comparison	Number of Observations	Average (percent)	t-Statistic	P(T > t)
Non-sponsored				
<i>High period</i>	69	12.95		
<i>Medium/Low period</i>	97	5.73		
diff		7.22	1.37	0.17
Venture Capital				
<i>High period</i>	20	8.86		
<i>Medium/Low period</i>	30	9.72		
diff		-0.86	-0.11	0.91
Buyout				
<i>High period</i>	24	7.63		
<i>Medium/Low period</i>	16	3.55		
diff		4.08	0.93	0.36

The table reports t-test results from the comparison of the average first-day return of IPOs issued in the high period to that of those issued in the medium/low period for each subgroup. The significance levels refer to two-sided t-tests of whether the average first-day returns in the two market periods are equal, where significance levels of 15 percent (*), 10 percent (**), 5 percent (***) and 1 percent (****) are highlighted.

The equal-weighted averages also differ within the groups by market condition at time of the IPOs. For each subgroup, we test the difference in average first-day return between the high

period and the medium/low period and the results from the tests are presented in table 7. As touched upon previously, the average first-day return in our sample is generally higher in the high period. This holds for NS and BO, while VC experiences marginally lower first-day returns in the high period. None of the differences are, however, statistically different from zero at reasonable significance levels. Thus, the data does not support hypothesis II(a). While the test did not statistically verify the difference in first-day return between the market conditions, the higher underpricing for all groups except VC-backed IPOs in high volume years may be explained by a shift in investor sentiment. When valuations are high, irrational investors are inclined to behave even more overoptimistic causing the closing price to deviate more from the offer price. The results for VC point in the other direction, with a small decline in underpricing in the high market period. This could potentially be explained by the fact that a disproportional amount of our VC-sample went public in the years around 2000, a period which was characterised by high underpricing, but has been defined as medium/low in our sample.

Table 8 - Tests comparing the change in average first-day return of BO-backed IPOs between the high and medium/low period to the corresponding change of the remaining sample

Comparison	Number of Observations	Average change (percent)	χ^2 -statistic	df	$P(X^2 > \chi^2)$
BO vs. NS					
<i>Buyout</i>	40	4.08			
<i>Non-sponsored</i>	116	7.22			
<i>diff</i>		-3.14			
Total	156		0.22	1	0.64
BO vs. VC					
<i>Buyout</i>	40	4.08			
<i>Venture Capital</i>	50	-0.86			
<i>diff</i>		4.94			
Total	90		0.37	1.00	0.54

The table reports test results comparing the change in average first-day return of BO-backed IPOs between the high and medium/low period to the corresponding change of the remaining sample. The significance levels refer to a test of whether the coefficients representing the average change for the subgroups between the high and medium/low period are equal, where significance levels of 15 percent (*), 10 percent (**), 5 percent (***) and 1 percent (****) are highlighted.

Finally, we present the results from the study of whether the average first-day returns of BO-backed IPOs are less affected by high period market conditions than the remaining sample in table 8. We test whether the difference in average first-day return for BO-backed IPOs between high and medium/low periods are different from the corresponding difference of the remaining

sample. We note that there is a negative difference for the BO vs. NS comparison and a positive difference in the BO vs. VC comparison. This implies that NS IPOs' degree of underpricing are rising more on an absolute level in high periods compared to medium/low in our sample with its 7.22 percentage point increase than that of BO with its 4.08 percentage points increase. The converse is true for VC-backed IPOs. The results also hold for a relative comparison, in high periods NS degree of underpricing increases by 126% while that of BO increases by 115% and that of VC decreases by 8.9% from the medium/low period. This result is in line with those of Bergström et al. (2006) and Levis (2011), whose samples of BO-backed IPO's did not experience an increase in underpricing as large as that of non-BO-backed IPOs in the high market period around 2000. The difference between NS could potentially be explained that BO-backed firms, are larger firms, and hence may have a lower fraction of irrational smaller investors who behave overoptimistically in the high market conditions (Bergström et al., 2006), resulting in less underpricing. However, as table 8 shows, none of these differences of change in underpricing are statistically significant at reasonable levels for any of the comparisons. Following this, we conclude that the data does not support hypothesis II(b) either.

6.3 Aftermarket performance

In the aftermarket performance study we begin by presenting the results from the even time calculations for BHAR and CAR and test for potential differences in performance of the groups over the entire period. This is followed by a brief discussion of the calendar time results before we move on to discuss performance with regards to the IPO cyclicalilty.

6.3.1 Event time results

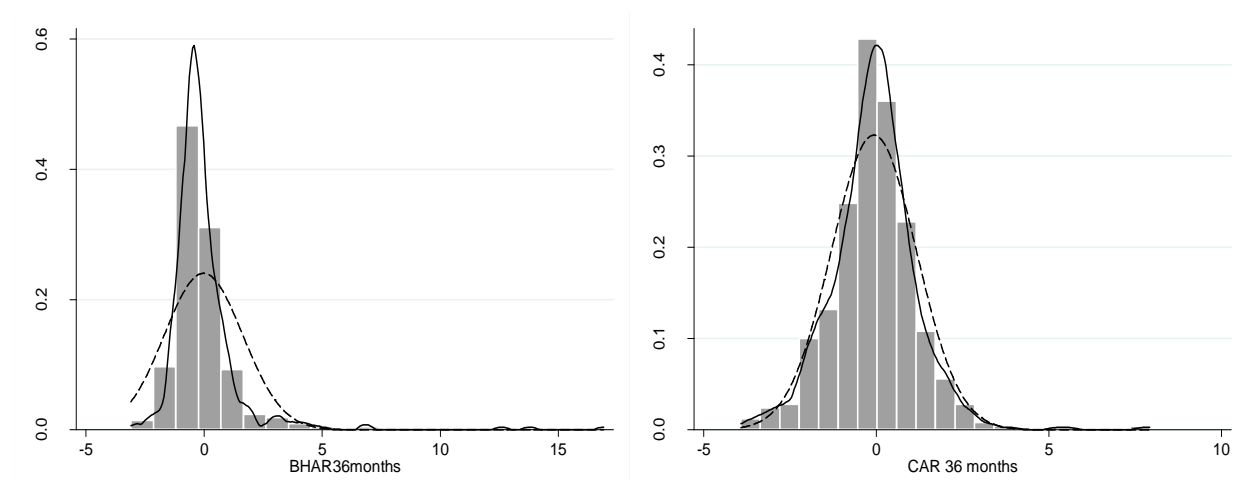
This subsection presents the results from the BHAR and CAR calculations in the event time approach. In figure 1, the distribution of the 36 month BHAR and CAR, with the MSCI Nordic Index used as benchmark, is plotted. As can be seen, BHARs 36 months (left) have a fat right-hand tail and demonstrate a large positive skewness. It reports a skewness of 5.32 and a kurtosis of 45.48. Three-year CARs (right) does not exhibit as large skewness as BHAR but still reports a skewness of 0.60 and a kurtosis of 7.66, which differs from the properties of a normal distribution⁸.

The two graphs in figure 1 reaffirm previous research highlighting that the BHAR produces more extreme results than CAR due to the effect of compounding (Barber & Lyon 1996, 1997; Schöber, 2008). As a result, average BHARs tend to be biased upwards, especially over longer

⁸ Normal distributions have a skewness of 0 and kurtosis of 3

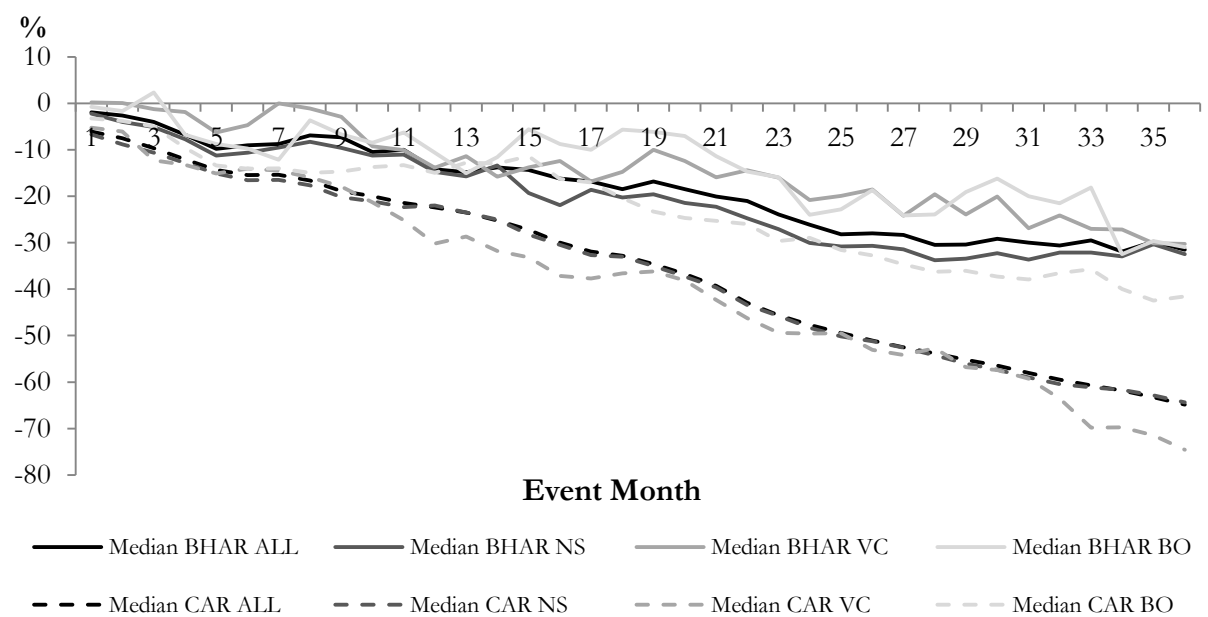
time horizons, due to the prevalence of extremely positive values in the sample over which the average is calculated (Schöber, 2008). As a consequence, similar to the argument put forward by Schöber (2008), we focus the discussion of BHAR on median values. As we wish to compare and contrast the BHAR results with CAR, medians will also be reported for CAR. Equal-weighted and value-weighted BHARs and CARs for our different time periods are reported in Appendix 4 and 5.

Figure 1 - Distribution of 36 month BHARs and CARs with MSCI Nordic Index used as benchmark



Distribution of BHARs and CARs in the first through 36 months following the IPO. The sample consists of 443 Nordic IPOs between January 1997 and December 2010. The bars show the histogram of BHAR and CAR distribution of the IPOs and the dashed lines show the fitted normal distribution whereas the solid lines show the kernel distribution plot.

Figure 2 - Median BHAR and CAR using the MSCI Nordic Index



BHAR and CAR series plotted for 36 months. Month 0 is one month after the IPO date. Total graph show BHAR and CAR series plotted for 36 event months. Month 0 is one month after the IPO date. BHARs are illustrated by solid lines and CARs by dashed lines.

Table 9 reports median BHARs in event time for all the groups in our Nordic sample of IPOs. The median BHARs are reported for periods of 6, 12, 24 and 36 months. Panel A reports median BHARs using MSCI Nordic Index as benchmark and Panel B reports the equivalent values calculated with our self-constructed benchmark, SBM. Consistent with earlier studies on the UK market (Levis, 2011) and the US market (e.g. Ritter, 1991; Cao & Lerner, 2009), our entire sample exhibit significant negative abnormal returns regardless of time period and benchmark used. As can be seen in Figure 2, the overall pattern of underperformance is persistent for all subgroups over the entire aftermarket period up to 36 months. The 36 month median BHARs in Panel A are statistically significant for all subgroups and there is only a small difference in underperformance between the groups in our sample in this period. BO-backed IPOs are performing somewhat better than NS in all periods, yet still underperforming the MSCI Nordic Index across all periods with a negative median BHAR of -9.73% after 6 months, followed by median BHARs of -10.64%, -23.97% and -30.95% for the 12, 24 and 36 month period respectively. All periods except the 12 month one are statistically different from zero at reasonable significance levels. After 6 months, the median abnormal return of the BO-group is slightly above that of NS, but after this the performance of the two groups diverges as the abnormal returns of the BO-group does not deteriorate as fast as that of NS.

The magnitudes of the negative median BHARs are smaller for almost all subgroups when the size and book-to-market benchmark (SBM) is used, the only exceptions being the median BHARs of VC in 6 months and BO in 12 months. The entire sample exhibits a negative median BHAR over 36 months of -29.09% (c.f. -31.51% when the MSCI Nordic Index is used as benchmark). In addition, the results in Panel B reveal larger differences in aftermarket performance across the subgroups of IPOs. In the 36 month period, NS IPOs have the most negative abnormal returns with a median BHAR lower than that of the entire sample and the other subgroups. Levis (2011) finds a similar result for his NS group on the UK-market. After 36 months, the median BHAR of BO-backed IPOs are now -21.33% while that of VC-backed and NS are -30.26% and -24.51% respectively. All these values are also statistically different from zero. In the event period of 12 months the median BHAR for BO is substantially lower than that of VC and NS and almost as low as that of BO in the 24 month period. This observation also stands out when it is compared to the results in Panel A as it is substantially lower than its corresponding value in this panel, while most median BHARs are higher. It is however not statistically significant.

Table 9 - Buy-and-hold abnormal returns in event time

Months	Medians (%)			
	ALL	NS	VC	BO
<i>Panel A. MSCI Nordic Index</i>				
6	-9.07**** (0.00)	-10.62**** (0.00)	-4.73 (0.91)	-9.73** (0.07)
12	-14.19**** (0.00)	-14.75**** (0.00)	-13.85 (0.35)	-10.64 (0.24)
24	-26.15**** (0.00)	-30.05**** (0.00)	-20.82 (0.33)	-23.97** (0.06)
36	-31.51**** (0.00)	-32.50**** (0.00)	-30.23*** (0.02)	-30.95*** (0.04)
<i>Panel B. SBM</i>				
6	-8.08**** (0.00)	-9.49**** (0.00)	-4.99 (0.89)	-8.35** (0.09)
12	-11.02**** (0.00)	-11.26**** (0.00)	-12.28 (0.34)	-17.04 (0.16)
24	-22.11**** (0.00)	-24.16**** (0.00)	-16.06 (0.48)	-19.21*** (0.04)
36	-29.09**** (0.00)	-30.26**** (0.00)	-24.51*** (0.02)	-21.33*** (0.03)

The total sample of 443 IPOs is comprised of 320 non-sponsored (NS), 70 venture-capital-backed (VC), and 53 buyout-backed (BO) IPOs from January 1997 to December 2010 listed on any of the Nordic stock exchanges. For each IPO, buy-and-hold abnormal return (BHAR) are calculated by compounding monthly returns for 6, 12, 24 and 36 months. If the IPO is delisted before the 36th month, returns are compounded until the delisting date. Panel A presents the median BHAR in percent calculated with the MSCI Nordic Index used as benchmark. Panel B reports median BHAR in percent calculated using our self-constructed SBM as benchmark. The significance levels refers to two-sided Wilcoxon signed-rank tests of whether the median values are different from zero, where significance levels of 15 percent (*), 10 percent (**), 5 percent (***) and 1 percent (****) along with p-values in parantheses are highlighted.

Table 10 reports median CARs in event time for all the groups in our sample of IPOs. As can be seen in table 10 and figure 2, the median CARs are reaffirming that IPOs overall and in all the subgroups are underperforming. However, regardless of benchmark used, the median CARs exhibit more severe underperformance than median BHARs. The entire sample benchmarked against MSCI Nordic Index yields negative median CARs for all time periods but these are not

statistically different from zero at reasonable significance levels in the time periods 12 and 36 months. Panel A illustrates that NS IPOs have statistically significant median CARs close to the overall sample whereas VC-backed IPOs are performing worse than the other subgroups in the periods of 12 to 36 months. These last two observations are however not statistically significant.

Table 10 - Cumulative abnormal returns in event time

Months	Medians (%)			
	ALL	NS	VC	BO
<i>Panel A. MSCI Nordic Index</i>				
6	-15.44*** (0.01)	-16.58**** (0.00)	-14.06 (0.36)	-14.06**** (0.00)
12	-22.41 (0.16)	-21.99**** (0.00)	-30.19 (0.23)	-14.96**** (0.00)
24	-47.70** (0.09)	-48.32**** (0.00)	-49.53 (0.32)	-28.94**** (0.00)
36	-64.88 (0.19)	-64.36**** (0.00)	-74.56 (0.22)	-41.56**** (0.00)
<i>Panel B. SBM</i>				
6	-14.43**** (0.00)	-14.04**** (0.00)	-17.79**** (0.00)	-10.19**** (0.00)
12	-22.71**** (0.00)	-20.77**** (0.00)	-32.73**** (0.00)	-14.22**** (0.00)
24	-41.98**** (0.00)	-42.86**** (0.00)	-47.99**** (0.00)	-28.24**** (0.00)
36	-59.09**** (0.00)	-60.09**** (0.00)	-70.02**** (0.00)	-39.50**** (0.00)

The total sample of 443 IPOs is comprised of 320 non-sponsored (NS), 70 venture-capital-backed (VC), and 53 buyout-backed (BO) IPOs from January 1997 to December 2010 listed on any of the Nordic stock exchanges. For each IPO, cumulative abnormal return (CAR) are calculated by summing monthly returns for 6, 12, 24 and 36 months. If the IPO is delisted before the 36th month, returns are calculated until the delisting date. Panel A presents the median CAR in percent calculated with the MSCI Nordic Index used as benchmark. Panel B reports median CAR in percent calculated using our self-constructed SBM as benchmark. The significance levels refers to two-sided Wilcoxon signed-rank tests of whether the median values are different from zero, where significance levels of 15 percent (*), 10 percent (**), 5 percent (***) and 1 percent (****) along with p-values in parantheses are highlighted.

Similar to the BHAR results, median CARs calculated with the SBM benchmark (Panel B) generally experience less negative median CARs than the ones calculated with the MSCI Nordic Index. In addition to a less severe underperformance in almost all subgroups and time periods, it becomes apparent that the VC-backed IPOs have the most negative abnormal return among the groups and more negative abnormal return than the total sample of all IPO firms. BO-backed IPOs outperform NS IPOs and VC-backed IPOs regardless of benchmark and across all time periods, yet are underperforming the MSCI Nordic Index with a 36 month's median CAR of -41,56% and the SBM with an equivalent CAR of -39.50%. Figure 2 shows that BO-backed IPOs have a similar median CAR to the other groups around the event period of 6 months when it is calculated using the MSCI Nordic Index. Prior to the event month 6, the median CAR of the BO group is somewhat higher than the other groups indicating superior short term aftermarket performance for BO IPOs. From event month 6 onwards, the patterns of the groups diverge. The median CARs for BO-backed IPOs deteriorates a lot less over time, than those of the others, indicating superior aftermarket performance in this period as well. The underperformance, as extreme as it may look is actually smaller than that in the findings of Bergström et al. (2006) for instance, who also note very severe underperformance over time in their CAR calculations.

In sum, the event time results examining BHAR and CAR reveal similar aftermarket performance for our entire sample. The deteriorating share price development over longer horizons of IPOs on the Nordic markets is consistent, irrespective of method and benchmark, with previous research on the US market (e.g. Ibbotson, 1975; Ritter, 1991; Schöber, 2008; Cao & Lerner, 2009) and UK market (Bergström et al., 2006; Levis, 2011). Calculations using the SBM benchmark yield less negative median abnormal returns than when MSCI Nordic Index is used as benchmark. This highlights the fact that abnormal returns are sensitive to benchmark employed. Our results are somewhat in line with those of Brav & Gompers (1997) who argue that the abnormal returns diminish if the size and book-to-market benchmark are used. It seems likely that our self-constructed benchmark is accounting for the higher risk and expected return of some stocks in a way that the MSCI Nordic Index did not. However, as we stated in the data criticism section, our self-constructed benchmark suffers from the drawback of survivorship bias and the lower abnormal returns may consequently just be a product of this bias. Nevertheless, regardless of benchmark and abnormal return metric used, three years after the IPO, all abnormal returns except CAR measured for MSCI Nordic Index are statistically significant at all reasonable levels. Most of the values are also highly significant in the 24 month period, but the shorter the period, the less unambiguous the result. Although all groups experience negative

median BHARs and CARs for every time period, some of them are not statistically significant. Following this pattern, we find that the data supports Hypothesis III (a) on a general level, and that it is especially true in longer time periods.

Table 9 and 10 highlight that BO-backed IPOs outperform other IPOs regardless of time period and benchmarks in the CAR analysis and in some periods in the BHAR analysis. This result is somewhat similar to the result illustrated by Bergström et al. (2006) and Cao & Lerner (2009). The former document that BO-backed IPOs severely underperform market indices in both Paris and London and the latter on the US market. Yet, the two studies find that BO-backed IPOs yield less negative abnormal returns than non BO-backed IPOs.

Our results can potentially be explained by the fact that investors of BO-backed IPOs in the Nordics have less diverging expectations than investors of VC-backed IPOs and NS IPOs. Even though we see similar signs as Aggarwal & Rivoli (1990) and Ritter (1991) of the so-called fads theory of deteriorating abnormal returns among the different IPOs, BO-backed IPOs are still generally less affected by this than NS IPOs and VC-backed IPOs, as can be seen from the abnormal return pattern in figure 2. It therefore seems likely that BO-backed IPOs in the Nordics hold less overoptimistic investors than the other types of IPOs. This is further supported by the fact that the BO-backed IPOs in our sample are, on average, larger companies, which Bergström et al. (2006) argue tend to attract more institutional investors. As these investors often act more professionally in the book-building process, there is less adjustment of expectations in the aftermarket leading to a smaller deterioration over time. Another potential explanation of the better aftermarket performance of BO-backed IPOs may be attributed to that BO firms are less likely to take a low quality firm public, as argued by Bergström et al. (2006). As an IPO involves greater publicity and reporting requirements than in other exit routes, BO firms stake their reputation and future fundraising to a larger extent in an IPO. Additionally, as BO firms usually retain a large fraction of shares after the IPO (Bergström et al., 2006) they are more likely floating firms of high quality with solid operating performance to continue maximizing the value of their investment. This leads to less diverging opinions in the aftermarket and BO-backed IPOs to outperform other IPOs, which may go public due to other reasons as get access to financing (Ritter & Welch, 2002).

Although the above analysis displays differences in medians between the subgroups in our sample, we want to establish if there is any statistically significant difference between BO-backed

IPOs and the other two groups. The Mann-Whitney U-test allows us to test hypotheses III (b), whether BO-backed IPOs are underperforming less than NS IPOs and VC-backed IPOs. As the BHAR metric is a more appropriate measure of investor experience (Schöber, 2008) and the 36 month period allows for ample time for diverging patterns to emerge (Loughran & Ritter, 1995) we test for differences in abnormal return on the median 36 month BHARs.

Table 11 - Mann-Whitney U-test of differences in the three year median BHAR between BO-backed IPOs and the remaining sample

3 year BHAR	Number of Observations	Mean Rank	z-Statistic	P(Z > z)
MSCI Nordic Index				
<i>BO vs. NS</i>				
<i>Buyout</i>	53	194[187]		
<i>Non-sponsored</i>	320	186[187]		
Total	373		0,513	0.61
<i>BO vs. VC</i>				
<i>Buyout</i>	53	62[62]		
<i>Venture Capital</i>	70	62[62]		
Total	123		-0.11	0.91
SBM				
<i>BO vs. NS</i>				
<i>Buyout</i>	53	199[187]		
<i>Non-sponsored</i>	320	185[185]		
Total	373		0.901	0.37
<i>BO vs. VC</i>				
<i>Buyout</i>	53	62[62]		
<i>Venture Capital</i>	70	62[62]		
Total	123		-0.12	0.91

The table reports Mann-Whitney U-test results on the comparison of the 36 month median BHAR between BO-backed IPOs and the remaining sample. The BHARs are calculated with the two different benchmarks; MSCI Nordic Index and size and book-to-market benchmark (SBM). Mean rank for the group is shown together with the expected rank in brackets. The significance levels refer to two-sided Mann-Whitney U-tests of whether the median 36 month BHARs in the two subgroups are equal, where significance levels of 15 percent (*), 10 percent (**), 5 percent (***) and 1 percent (****) are highlighted.

As can be seen from the Mann-Whitney U-test in table 11, there is no statistically significant difference between BO-group and the other subgroups. The difference is somewhat more significant when benchmarking BO-backed IPOs against NS IPOs in SBM, which may be attributable to the fact that there is a larger difference in median returns between the subgroups. As our sample converges in the 36th event month and differences between the groups are more pronounced in some other periods we also perform the same tests for the 6, 12, 24 months but

none of the tests yield any statistically significant difference between the groups. Consequently we find no support for hypothesis III(b) in the data.

6.3.2 Calendar time results

For the following analysis and the cyclicity results and discussion we calculate abnormal returns using only the broad market index as we have some concerns regarding the survivorship bias and want to facilitate comparisons with prior and potential future studies.

Table 12 illustrates yearly calendar time abnormal returns for the sample groups calculated with the MSCI Nordic Index benchmark. Due to that several years, especially in value weighted terms, are affected by extreme values, we have also chosen to display median values based on the yearly compounded IPO portfolio returns similar to Gompers & Lerner (2003). As can be seen, there are large differences between equal-weighted and value-weighted returns. The equal-weighted results indicate that the entire sample is somewhat underperforming over the period when the median yearly abnormal return of the IPO portfolios is studied. Switching to the average yearly abnormal return of the IPO portfolios provides ground for a slightly different conclusion. In this metric, only the BO-backed IPO portfolio is underperforming with small negative abnormal returns of -1.73%. The portfolios of VC-backed, NS and the entire sample experience weak positive abnormal returns of 0.07%, 1.04% and 0.30% respectively. In the individual years, the total IPO portfolio underperforms the MSCI Nordic Index in ten out of seventeen years. The negative equal-weighted median yearly abnormal return of -4.77% in the Nordic sample is somewhat lower than the equivalent return of -1.3% measured by Gompers & Lerner (2003) on the US market. The performance over the period, in terms of medians of the yearly values, differs between the subgroups, with VC backed IPOs demonstrating the worst performance (-6.93%) followed by BO (-4.21%) and NS (-4.00%).

In contrast, the value-weighted results indicate that portfolios of IPOs in the Nordics in general outperform the MSCI Nordic Index in all groups. The entire sample exhibit positive yearly compounded IPO portfolio abnormal returns in all years except 1997 and 1998. The result stands in contrast to previous research (e.g. Gompers & Lerner, 2003; Levis, 2011) who observes negative yearly value-weighted abnormal returns, more consistent with their negative equal-weighted ones. Both the average and the median yearly returns are positive for all groups.

Table 12 - Three year abnormal return in calendar time by MSCI Nordic Index

Months	Equal Weighted (%)				Value Weighted (%)			
	ALL	NS	VC	BO	ALL	NS	VC	BO
1997	-37.4	-61.4	-15.4	37.7	-30.2	-63.7	-13.9	26.3
1998	-28.8	-35.4	-27.3	-6.8	-20.3	-36.5	-39.3	36.2
1999	-6.1	5.3	-22.9	-40.7	17.4	-15.5	22.1	145.9
2000	1.6	-12.0	73.3	-2.0	20.4	-6.1	154.9	60.0
2001	1.2	10.8	-6.6	-18.1	30.7	36.9	16.2	-2.0
2002	-10.3	0.4	-18.8	-26.5	25.9	28.2	10.9	-2.6
2003	30.3	35.5	31.8	3.4	22.7	21.7	20.1	28.4
2004	-4.8	-9.0	-2.6	-4.2	20.8	40.1	19.9	-14.0
2005	30.2	32.5	46.9	6.4	50.2	63.8	55.4	26.2
2006	4.9	4.0	-6.5	22.4	32.0	35.7	30.9	18.3
2007	-18.0	-18.4	-23.0	-10.6	18.0	-1.2	95.8	-9.3
2008	2.6	2.9	9.2	-8.8	10.1	17.8	-14.6	12.1
2009	-6.6	-7.2	-7.6	2.4	9.0	23.1	-21.6	3.3
2010	-16.2	-15.8	-19.3	-19.5	2.6	10.4	-4.6	-22.2
2011	-1.1	-4.0	10.3	-29.1	33.9	16.8	247.1	-27.1
2012	-15.7	-21.1	-6.9	23.6	19.2	5.1	-4.4	61.4
2013	79.2	110.5	-13.4	40.9	34.0	20.1	-25.6	53.2
Average	<i>0.30</i>	<i>1.04</i>	<i>0.07</i>	<i>-1.73</i>	<i>17.45****</i>	<i>11.58*</i>	<i>32.32**</i>	<i>23.17***</i>
t-statistic	<i>(0.96)</i>	<i>(0.91)</i>	<i>(0.99)</i>	<i>(0.74)</i>	<i>(0.00)</i>	<i>(0.13)</i>	<i>(0.09)</i>	<i>(0.04)</i>
Median	<i>-4.77</i>	<i>-4.00</i>	<i>-6.93</i>	<i>-4.21</i>	<i>20.42</i>	<i>17.79</i>	<i>16.21</i>	<i>18.26</i>

The total sample of 443 IPOs is comprised of 320 non-sponsored (NS), 70 venture-capital-backed (VC), and 53 buyout-backed (BO) IPOs. Annual abnormal returns shown in the table are calculated by compounding monthly IPO portfolio returns by year and subtracting the yearly compounded return of the MSCI Nordic Index benchmark. IPO firms are defined as firms that entered their aftermarket performance period within the previous 36 calendar months. Portfolios are formed by calendar month and subgroup. Value-weights are based on previous month's market value. Note that 1997 only includes NS IPOs from February, VC IPOs from March and BO IPOs from May. The t-statistics reported for abnormal returns are from t-tests of the null hypothesis that the average mean annual abnormal returns are different from zero. Significance levels of 15 percent (*), 10 percent (**), 5 percent (***) and 1 percent (****) along with p-values in parantheses are highlighted.

The calendar time analysis reports fundamentally different results for the equal- and value-weighted portfolios. The yearly returns fluctuate heavily between the groups and calendar years. The conclusions are different if one were to look at the yearly median values or the yearly average values of the portfolios in each weighting scheme. Moreover, in the value-weighted portfolio, the yearly averages are statistically different from zero, but the equal-weighted ones are not. Consequently, it is hard to ascertain a consistent pattern and draw any real conclusions from the table above.

6.3.3 Cyclicity and aftermarket performance

Table 13 - Median buy-and-hold abnormal returns in event time by IPO activity period

Months	Medians (percent)			
	ALL	NS	VC	BO
<i>Panel A. High Period</i>				
6	-4.10 (0.57)	-3.81 (0.79)	-6.09 (0.75)	-2.62 (0.48)
12	-2.99 (0.62)	0.10 (0.85)	-14.10 (0.37)	-6.67 (0.40)
24	-14.56*** (0.03)	-9.11 (0.13)	-23.32 (0.28)	-14.62 (0.14)
36	-20.26**** (0.00)	-16.22*** (0.03)	-31.23** (0.06)	-22.50 (0.22)
<i>Panel B. Medium/Low Period</i>				
6	-13.49**** (0.00)	-14.08**** (0.00)	-3.21 (0.87)	-12.33** (0.07)
12	-25.95**** (0.00)	-19.67**** (0.00)	-13.76 (0.68)	-19.67 (0.48)
24	-41.13**** (0.00)	-45.57**** (0.00)	-13.17 (0.74)	-35.95 (0.18)
36	-39.31**** (0.00)	-48.59**** (0.00)	-29.04*** (0.10)	-39.29* (0.10)

The total sample of 443 IPOs is comprised of 320 non-sponsored (NS), 70 venture-capital-backed (VC), and 53 buyout-backed (BO) IPOs. The table reports median buy-and-hold abnormal returns (BHAR) by market period calculated using the MSCI Nordic Index as benchmark. For each IPO, buy-and-hold abnormal return (BHAR) are calculated by compounding monthly returns for 6, 12, 24 and 36 months. If the IPO is delisted before the 36th month, returns are compounded until the delisting date. The high IPO activity period extends between 2005-2007 and the remaining years are classified as medium/low IPO activity. IPO activity period groups are formed on these classifications and time of issuance of each IPO. The significance levels refers to two-sided Wilcoxon signed-rank tests of whether the median values are different from zero, where significance levels of 15 percent (*), 10 percent (**), 5 percent (***) and 1 percent (****) along with p-values in parantheses are highlighted.

Table 13 illustrates median BHARs in event time by IPO activity period using the MSCI Nordic Index as benchmark. As mentioned above, our IPO firms are classified as high and medium/low

issue firms depending on the year when they went public. The median BHARs of the groups by IPO activity periods clearly diverges in the aftermarket performance up to 36 months. In contrast to previous research, we find that all IPOs, except VC-backed, floated in high market periods are underperforming MSCI Nordic Index less severely than IPOs floated in medium/low activity regardless of time horizon. VC-backed IPOs, on the other hand, demonstrate the opposite pattern with firms floated in high years experiencing worse underperformance in the aftermarket than if floated in medium/low years. The aftermarket performance patterns on the Nordic markets appears to some extent be linked to the time of going public. Yet, few of the observations for the subgroups are significantly different from zero and can therefore not be statistically verified.

Panel A illustrates that the entire sample of IPOs floated in high market periods is significantly underperforming in two to three years after the IPO. VC-backed IPOs have more negative performance after three years than the other subgroups, followed by BO-backed IPOs and NS IPOs. A similar pattern is observed for all time periods in high market conditions. BO-backed IPOs are, however, not significant in any of our time horizons. Panel B exhibit median BHAR for firms floated in medium/low market periods. Three years after the IPO, all subgroups demonstrate significant underperformance with NS IPOs performing the worst followed by BO-backed IPOs and VC-backed IPOs.

Our results can be contrasted to the results presented by Ritter (1991) and Bergström et al. (2006). They find that firms going public in high volume years are performing the worst whereas we find that IPOs issued in the medium/low IPO activity period demonstrate the most negative abnormal returns for our entire sample. Considering that we find that all IPOs except VC-backed IPOs are having a higher first-day return in high volume years, one would also expect that this over optimism leads to a sharp decline in the aftermarket as investors reassess their expectations. This is, however, not what our study reveals. A potential explanation behind the differences in performance pattern between our study and previous research may be attributable to that we examined a different period of high IPO activity and that our study covers a different geography. More recent research by Loughran and Ritter (2004), Bergström et al. (2006) and Levis (2011) note that the years 1999-2000, around the IT-bubble are high volume years whereas in our sample a higher IPO activity period is registered in 2005-2007. Hence, there may be a different pattern of performance between the different high volume periods. As suggested by our sample results, the high volume period in 2005-2007 in the Nordics demonstrate less

underperformance than in medium/low IPO activity for the entire sample and all subgroups except VC.

Our results could be contrasted to Schöber (2008) and Cao (2011) who find that that BO-backed IPOs in high volume years are performing the worst among the IPO activity periods. Cao (2011) attribute the poor aftermarket performance to that BO-backed IPOs may shorten the BO-duration to take advantage of the high valuations. As Nordic BO-backed IPOs floated in the high IPO activity period does not exhibit the poorest performance, we find reasons to believe that the IPOs floated in 2005-2007 by BO firms were not hastily flipped but had reached the end of their holding period with successful restructurings.

Table 14 - Mann-Whitney U-test of differences in three year median BHAR between high and medium/low period for each subgroup

3 year BHAR	Number of Observations	Mean Rank	z-Statistic	P(Z > z)
Non-sponsored				
<i>High period</i>	139	181 [161]		
<i>Medium/ Low period</i>	181	145 [161]		
Total	320		3.50	0.00****
Venture Capital				
<i>High period</i>	26	35 [36]		
<i>Medium/ Low period</i>	44	36 [36]		
Total	70		-0.27	0.79
Buyout				
<i>High period</i>	25	30 [27]		
<i>Medium/ Low period</i>	28	25 [27]		
Total	53		1.18	0.24

The table reports Mann-Whitney U-test results from the comparison of the 3 year median BHAR, using MSCI Nordic Index as benchmark, of IPOs issued in the high period to that of those issued in the medium/low period for each subgroup. The significance levels refer to two-sided Mann-Whitney U-tests of whether the average 3 year BHAR in the two market conditions are equal, where significance levels of 15 percent (*), 10 percent (**), 5 percent (***) and 1 percent (****) are highlighted.

After observing that the median BHARs in table 13 demonstrate that firms floated in high volume years experience less underperformance than those floated in medium/low volume years, we test if these differences are statistically significant. Similar to the argumentation above, we employ the Mann-Whitney U-test to test whether firms floated in high IPO periods perform

differently than those floated in medium/low periods. Table 14 shows that there is a significant difference between 3 year BHARs between firms floated in high periods and medium/low periods for the NS subgroup. Contrarily to what we hypothesized, this implies that high volume IPO activity experiences less underperformance than medium/low periods for this group. The two other subgroups do not demonstrate any significant difference between the different market conditions. Thus hypothesis III(a) is not supported by the data for any of the groups, but for different reasons.

Table 15 - Tests comparing the change in average equal-weighted three year BHAR of BO-backed IPOs between the high and medium/low period to the corresponding change of the remaining sample

Comparison	Number of Observations	Average change (percent)	χ^2 -statistic	df	$P(X^2 > \chi^2)$
BO vs. NS					
<i>Buyout</i>	53	-26.70			
<i>Non-sponsored</i>	320	1.98			
<i>diff</i>		-28.67			
Total	373		0.27	1	0.60
BO vs. VC					
<i>Buyout</i>	53	-26.70			
<i>Venture Capital</i>	70	-35.06			
<i>diff</i>		8.37			
Total	123		0.02	1	0.89

The table reports test results comparing the change in average 36 month BHAR of BO-backed IPOs between the high and medium/low period to the corresponding change of the remaining sample. The significance levels refer to a test of whether the coefficients representing the average change for the subgroups between the high and medium/low period are equal, where significance levels of 15 percent (*), 10 percent (**), 5 percent (***) and 1 percent (****) are highlighted.

Following the somewhat surprising results presented earlier, we proceed to test our last hypothesis, that the hypothesised tendency of BO-backed IPOs' to perform worse in high market periods is even more pronounced than that of NS and VC. Ideally, we would try to infer this from the medians, but as it is statistically problematic to compare the difference of changes in medians, we have decided to resort to the equal-weighted averages for this last analysis. In order to test whether BO-backed IPOs' degree of underperformance are more affected by market conditions than VC-backed and NS IPOs, we test the differences in 36 month's equal-weighted average BHAR in high versus medium/low periods for BO-backed IPOs compared to the other subgroups. The results are illustrated in table 15 and are discussed in detail below.

First of all, one notes that the change in equal-weighted average BHAR performance for the different subgroups between the high and medium/low periods differ somewhat to our previous analysis where we examined the medians. Looking at equal-weighted average 36 month BHAR for BO, we can see that the group, in contrast to the previous median analysis, performs a lot worse in high market periods. The difference is striking, with equal-weighted means being 26.70 percentage points lower in high market periods compared to that of medium/low. The VC-group follow the same pattern as the above median analysis as it experience worse performance in high periods for this metric as well. The difference is however a lot more pronounced, with a change in average 36 month BHAR of -35.06 percentage points between the high and medium/low period. Finally the change in performance of the NS group follows the same pattern regardless of looking at medians or the equal-weighted 36 months BHARs with the underperformance being larger in the medium/low period. The effect is however a lot more pronounced in the above median analysis where there is a large difference in the observations which is also statistically significant while the difference in equal-weighted mean amounts to 1.98 percentage points between the high and medium/low period.

An examination of the differences of the changes in table 15 reveals that the performance of BO-backed IPOs are a lot more negatively affected in the high period compared to that of NS. The converse is true for the comparison with the VC group. BO-backed IPOs' 36 month equal-weighted BHAR deteriorates -28.67 percentage points more than the NS group and deteriorates 8.37% less than the VC group in the high period compared to the medium/low period. The test of whether there is a difference in the changes' between BO-backed IPOs and the other groups are not statistically significant for any of the comparisons though.

Similar to the equivalent test for underpricing, we note that there is a negative difference for the BO vs. NS comparison and a positive difference in the BO vs. VC comparison. This implies that NS IPOs' degree of underperformance are rising on an absolute level in high periods compared to medium/low in our sample with its 1.98 percentage point whereas BO-backed IPOs decrease with -26.70 percentage points. VC-backed IPOs demonstrate an even large negative average difference between high and medium/low IPO activity periods implying that they may be more affected by market conditions than the BO-backed IPOs. However, none of the tests show that the average change between high and medium/low IPO activity periods are equal between the subgroups. Consequently, we do not find support in the data for hypotheses III(b).

7 Conclusions

Using a sample of 443 Nordic IPOs, consisting of NS, VC-backed and BO-backed issues from January 1997 to December 2010, this paper has investigated the financial performance of IPOs in terms of underpricing and underperformance on the Nordic market. The focus of the study has been to compare and contrast the financial performance of BO-backed IPOs to those of the other groups as well as investigate the financial performance pattern of IPOs depending on market condition at time of issuance. A two-fold research question is formalised as: *How do buyout-backed IPOs in the Nordics perform and do the performance of these IPOs differ depending on the market conditions at the time of issuance?* To answer this, eight hypotheses are developed, each of which is explicitly tested using appropriate statistical methods. A summary of the results from the empirical study of these is presented in table 16.

Table 16 - Our hypotheses

Hypotheses	Statistical test	Support
First day return		
I(a) All IPOs in our sample will experience underpricing irrespective of being BO-backed, VC-backed or NS	Two-sided t-test	Yes
I(b) BO-backed IPOs will experience less underpricing than VC-backed and NS IPOs	Two-sided t-test	No
II(a) All IPOs in our sample will experience higher underpricing in markets characterised by high IPO activity than in other periods, irrespective of being BO-backed, VC-backed or NS	Two-sided t-test	No
II(b) BO-backed IPO's degree of underpricing will be less affected in high IPO activity markets than VC-backed and NS IPOs	Test	No
Long-term performance		
III(a) All IPOs in our sample will experience underperformance irrespective of being BO-backed, VC-backed or NS	Wilcoxon Sign-ranked test	Yes ¹
III(b) BO-backed IPOs will experience less underperformance than VC-backed and NS IPOs	Mann-Whitney U-test	No
IV(a) All IPOs in our sample will experience higher underperformance in market conditions of high IPO activity than in other periods, irrespective of being BO-backed, VC-backed or NS	Mann-Whitney U-test	No
IV(b) BO-backed IPOs' degree of underperformance will be more affected in high IPO activity markets than VC-backed and NS IPOs	Test	No

1) Three years after the IPO, all abnormal returns except CAR measured for MSCI Nordic Index are statistically significant at 0.01 level

The results confirm that IPOs in the Nordics are subject to underpricing regardless of being BO-backed, VC-backed or NS. The magnitudes of the underpricing in our Nordic sample are rather small compared to those in the literature from studies conducted on other markets (e.g. Bergström et al., 2006; Levis, 2011). A possible explanation to this can be a general reduction in investor ex-ante uncertainty facilitated by transparency and easy access to information in the Nordic countries. In line with previous research, BO-backed IPOs experience lower average underpricing in our sample than that of NS and BO on an equal-weighted basis, possibly explained by some combination of certification, higher fraction of institutional investors and underwriter relationship. The difference is, however, not statistically significant. Comparisons to studies on other markets inferred that our BO-backed sample experienced underpricing in the

lower range (c.f. Bergström et al., 2006; Schöber, 2008; Levis, 2011). A plausible explanation to this can be found in the relationship between the BO firms and the underwriter. As private equity BO firms are lucrative, repeat customers of the underwriting banks, these underwriters are inclined to restrict the level of underpricing. The underwriters in the Nordics may potentially be more inclined to do so as they are heavily dependent on these customers due to the scale of the BO-industry in the region.

The BO group and NS group in our sample experience higher underpricing in high IPO activity markets compared to medium/low activity periods. None of these differences are statistically significant though. The higher underpricing in high market conditions is consistent with earlier research on samples on other markets around the dot-com bubble period (Bergström et al., 2006; Cao & Lerner 2009; Levis, 2011) We hypothesise that this is caused by a shift in investor sentiment in high market periods that cause irrational investors to behave even more optimistically, but do not test for this. The results for VC-backed IPOs points in the other direction, with a small decline in underpricing in the high market period, explained by the fact that the medium/low periods include some extreme observations of underpricing during the dot-com bubble. Finally, we compare the difference in the change in underpricing between high and medium/low market periods for BO-backed IPOs against the other groups. The results show that BO-backed IPOs experience less dramatic increases in underpricing compared to NS in both absolute and relative terms. The comparison against VC groups on the other hand show that BO-backed firms' degree of underpricing increases a lot more, a not so surprising result given the above analysis of VC underpricing in different periods. A potential explanation to the lower relative increase in underpricing of BO-backed IPOs compared to that of NS could be linked to the investor distribution in the respective IPO types. BO-backed IPOs, are generally larger and attract a larger fraction of institutions and other sizeable investors, which tend to behave more rationally.

The aftermarket performance results reported for BHAR and CAR in event time, calculated against both our benchmarks, all present underperformance for all our sample groups in all periods. These are also statistically significant in almost all the results for the longer time periods for the entire sample which lead us to confirm that there is support in the data for underperformance in the longer 36 month event period. The difference in the results between the MSCI Nordic benchmark and our self-constructed SBM benchmark can potentially be explained by the fact that the portfolios matched on size and book-to-market in this benchmark

manages to control for certain risk characteristics of the IPO-firms which the MSCI Nordic index does not. We do, however, recognise that this effect could stem from a survivorship bias inherent in our SBM benchmark.

The calendar time results provides an inconsistent pattern, where the median yearly abnormal equal-weighted portfolio returns suggests underperformance over the period while the average yearly abnormal equal-weighted portfolio returns suggests the opposite. The picture gets even more complicated when the abnormal value-weighted portfolio returns are examined. From this analysis, we see large positive abnormal returns on both median yearly values and average yearly values. The averages are also statistically significant. It is also hard to ascertain anything from individual years, although we recognise that the equal-weighted portfolio experiences underperformance in 10 out of 17 years for the entire sample, while the value-weighted one outperforms the benchmark in 15 out of 17 years.

The pattern of underperformance in event time is consistent with a large body of previous research (e.g. Ritter, 1991; Loughran & Ritter, 2004; Bergström et al., 2006; Cao & Lerner, 2009) Moreover, BO-backed IPOs perform relatively better than the other groups in most periods when examining BHAR and CAR calculated with the two different benchmarks, yet it still underperforms both benchmarks. Unfortunately we cannot statistically verify that there is a difference in the performance between the groups in any time period. Relating back to theory, we propose that this relatively better performance of BO-backed IPOs could be explained by investor sentiment. The investors in BO-backed IPOs are to a larger fraction institutions with less diverging opinions which acts more rational in the book-building process, leading to less adjustments in the aftermarket. Moreover, we also argue that another reason behind the better performance of BO-firms may be attributable to the fact that BO firms are less likely to take a low quality firm public due to reputational concerns, retained ownership and future fundraising.

The results from the analysis of market conditions and cyclicity is surprising in the sense that median BHARs for the high market period are lower than medium/low IPO activity period for all groups in all time periods except for VC who show the opposite pattern in all time periods. Thus, the only group which experienced results similar to what we were expecting are the VC group. Rather few of the observations are statistically significant though. The results for BO stand in contrast to those presented by Bergström et al. (2006) who find that IPOs floated in the high market period perform the worst. It should be noted, that the high market period in their

study is defined as the dot-com bubble, 2000-2001. As our high market period, 2005-2007, differs from that of theirs it is not unreasonable that the aftermarket performance also differs. Tests of the statistical significance of the differences between market periods reveal that the only statistical significance is that for the NS group.

The last test of whether BO-backed IPOs' degree of underperformance are more affected by market conditions than VC-backed and NS IPOs reveal that the average BHAR of BO-backed IPOs in the 36 month period is more affected by market conditions than that of NS but less so than that of VC. The results are however not statistically significant. The analysis is complicated by the fact that we have to look at the average equal-weighted BHARs which go in the opposite direction as the median BHAR for the same period.

In sum, we find evidence of both underpricing and underperformance in all groups in our Nordic sample over the studied period. Evidence from our sample points towards less underpricing and underperformance of BO-backed IPOs, but we cannot statistically verify that there are any differences between our subgroups of IPOs. Moreover, we note surprising results when studying the results depending on market periods, but these are not possible to verify either.

The evidence presented in this thesis only begins to scratch the surface of the Nordic BO-backed IPO market characteristics. We present empirical evidence of the BO-backed IPO performance over an extensive time period covering most of the lifespan of the Nordic BO-industry and contrast the results to other IPOs in the region. We give plausible explanations to performance patterns, backed by established theories, but do not test for these explicitly. Building on our rather general findings, we call for research conducted using a more granular approach, investigating the reasons underlying the financial performance of BO-backed IPOs in the Nordics.

8 References

- Aggarwal, R. 2000, "Stabilization activities by underwriters after initial public offerings", *The Journal of Finance*, vol. 55, no. 3, pp. 1075-1103.
- Aggarwal, R. & Rivoli, P. 1990, "Fads in the initial public offering market?", *Financial Management*, vol. 19, pp. 45-57.
- Andersson, K. 2013, "Nya bolag på börsen har fått jobbiga starter", Svenska Dagbladet, 27 November, pp.14.
- Banz, R.W. 1981, "The relationship between return and market value of common stocks", *Journal of Financial Economics*, vol. 9, no. 1, pp. 3-18.
- 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*, vol. 43, no. 3, pp. 341-372.
- Barber, B.M. & Lyon, J.D. 1996, "Detecting abnormal operating performance: The empirical power and specification of test statistics", *Journal of Financial Economics*, vol. 41, no. 3, pp. 359-399.
- Beatty, R.P. & Ritter, J.R. 1986, "Investment banking, reputation, and the underpricing of initial public offerings", *Journal of Financial Economics*, vol. 15, no. 1-2, pp. 213-232.
- 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*, vol. 9, no. 4, pp. 16-47.
- Bilo, S., Christophers, H., Degosciu, M. & Zimmermann, H. 2005, *Risk, returns, and biases of listed private equity portfolios*, Working Paper, University of Basel, Basel.
- Björke, G. & Menzel, M. 2006, "Long-Run IPO Underperformance on the Swedish Equity Market", Master Thesis, Stockholm School of Economics, Stockholm.
- Booth, J.R. & Smith II, R.L. 1986, "Capital raising, underwriting and the certification hypothesis", *Journal of Financial Economics*, vol. 15, no. 1, pp. 261-281.
- Brav, A., Geczy, C. & Gompers, P.A. 2000, "Is the abnormal return following equity issuances anomalous?", *Journal of Financial Economics*, vol. 56, no. 2, pp. 209-249.
- 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*, vol. 52, no. 5, pp. 1791-1821.
- Bråse, R. 2011, "Börsfiasko för riskkapitalet", *Dagens Industri*, 31 August, pp.8.
- Cao, J.X. 2011, "IPO timing, buyout sponsors' exit strategies, and firm performance of RLBOs", *Journal of Financial and Quantitative Analysis*, vol. 46, no. 04, pp. 1001-1024.

- Cao, J. & Lerner, J. 2009, "The performance of reverse leveraged buyouts", *Journal of Financial Economics*, vol. 91, no. 2, pp. 139-157.
- Cowan, A.R. & Sergeant, A. 2001, "Interacting biases, non-normal return distributions and the performance of tests for long-horizon event studies", *Journal of banking & finance*, vol. 25, no. 4, pp. 741-765.
- EVCA Guide on Private Equity and Venture Capital for entrepreneurs, 2007, European Private Equity and Venture Capital Association (EVCA), Brussels, viewed 15 May 2014, Available: http://www.evca.eu/uploadedfiles/home/toolbox/introduction_tutorial/evca_pecguide.pdf
- Fama, E.F. 1998, "Market efficiency, long-term returns, and behavioral finance", *Journal of Financial Economics*, vol. 49, no. 3, pp. 283-306.
- Fama, E.F. & French, K.R. 1993, "Common risk factors in the returns on stocks and bonds", *Journal of Financial Economics*, vol. 33, no. 1, pp. 3-56.
- Fama, E.F. & French, K.R. 1992, "The cross-section of expected stock returns", *the Journal of Finance*, vol. 47, no. 2, pp. 427-465.
- Goksör, J. 2013, "Företag köar för att komma in på börsen", *Dagens Nyheter*, 28 November, pp.31.
- Gompers, P.A. & Lerner, J. 2003, "The really long-run performance of initial public offerings: The pre-Nasdaq evidence", *The journal of finance*, vol. 58, no. 4, pp. 1355-1392.
- Holthausen, R.W. & Larcker, D.F. 1996, "The financial performance of reverse leveraged buyouts", *Journal of Financial Economics*, vol. 42, no. 3, pp. 293-332.
- Högberg, J. 2012, "Riskfyllt att köpa av riskkapitalist", *Affärsvärlden*, 17 april 2012, viewed 2014-05-14, Available: <http://www.affarsvarlden.se/tidningen/article3456957.ece>
- Ibbotson, R.G. & Jaffe, J.F. 1975, "'Hot issue' markets", *The journal of finance*, vol. 30, no. 4, pp. 1027-1042.
- Ibbotson, R.G. 1975, "Price performance of common stock new issues", *Journal of Financial Economics*, vol. 2, no. 3, pp. 235-272.
- Jenkinson, T. & Ljungqvist, A. 2001, *Going public: The theory and evidence on how companies raise equity finance*, Oxford University Press.
- Kaplan, S.N. & Strömberg, P. 2008, "Leveraged buyouts and private equity", *Journal of Economic Perspectives*, vol. 23, pp. 121-146.
- Kothari, S. & Warner, J.B. 1997, "Measuring long-horizon security price performance", *Journal of Financial Economics*, vol. 43, no. 3, pp. 301-339.

- Levis, M. 2011, "The Performance of Private Equity-Backed IPOs", *Financial Management*, vol. 40, no. 1, pp. 253-277.
- Loughran, T. & Ritter, J.R. 1995, "The new issues puzzle", *The Journal of Finance*, vol. 50, no. 1, pp. 23-51.
- Loughran, T., Ritter, J.R. & Rydqvist, K. 1994, "Initial public offerings: International insights", *Pacific-Basin Finance Journal*, vol. 2, no. 2, pp. 165-199.
- Loughran, T. & Ritter, J. 2004, "Why Has IPO Underpricing Changed over Time?", *Financial Management*, vol. 33, no. 3, pp. 5-37.
- Lowry, M. & Schwert, G.W. 2002, "IPO market cycles: Bubbles or sequential learning?", *The Journal of Finance*, vol. 57, no. 3, pp. 1171-1200.
- Lyon, J.D., Barber, B.M. & Tsai, C. 1999, "Improved methods for tests of long-run abnormal stock returns", *The Journal of Finance*, vol. 54, no. 1, pp. 165-201.
- McCahery, J.A. & Vermeulen, E.M. 2013, "Recasting Private Equity Funds after the Financial Crisis The End of 'Two and Twenty' and the Emergence of Co-Investment and Separate Account Arrangements", Working paper No. 231-2013, European Corporate Governance Institute (ECGI), viewed 18 May 2014, Available: <http://ssrn.com/abstract=2351816> or <http://dx.doi.org/10.2139/ssrn.2351816>
- Meggison, W.L. & Weiss, K.A. 1991, "Venture Capitalist Certification in Initial Public Offerings", *The Journal of Finance*, vol. 46, no. 3, pp. 879-903.
- Miller, E.M. 1977, "Risk, uncertainty, and divergence of opinion", *The Journal of Finance*, vol. 32, no. 4, pp. 1151-1168.
- Mitchell, M.L. & Stafford, E. 2000, "Managerial decisions and long-term stock price performance*", *The Journal of Business*, vol. 73, no. 3, pp. 287-329.
- Mogilevsky, V. & Murgulov, Z. 2012, "Underpricing of private equity backed, venture capital backed and non-sponsored IPOs", *Investment Management and Financial Innovations*, vol. 9, no. 3, pp. 47-59.
- Nordenstam, S. & Pollard, N. 2013, "Sanitec shares rise in Sweden's biggest IPO since 2006", *Reuters*, 10 december 2013, viewed 2014-05-14, Available: <http://www.reuters.com/article/2013/12/10/sanitec-ipo-idUSL6N0JP0VR20131210>
- Otchere, I., Owusu-Antwi, G. & Mohsni, S. 2013, "Why are stock exchange IPOs so underpriced and yet outperform in the long run?", *Journal of International Financial Markets, Institutions and Money*, vol. 27, pp. 76-98.
- Pástor, L. & Veronesi, P. 2005, "Rational IPO waves", *The Journal of Finance*, vol. 60, no. 4, pp. 1713-1757.
- PwC Riskpremiestudien 2014, 2014, PwC, Sweden, viewed 2014-05-14, http://www.pwc.se/sv_SE/se/publikationer/assets/pdf/riskpremiestudien-2014.pdf

- Ritter, J.R. 1991, "The long-run performance of initial public offerings", *The journal of finance*, vol. 46, no. 1, pp. 3-27.
- Ritter, J.R. 1984, "The " hot issue" market of 1980", *Journal of Business*, , pp. 215-240.
- Ritter, J.R. & Welch, I. 2002, "A Review of IPO Activity, Pricing, and Allocations", *The Journal of Finance*, vol. 57, no. 4, pp. 1795-1828.
- Schöber, T. 2008, *Buyout-Backed Initial Public Offerings*, Dissertation (No. 3479), Department of Business Administration, University Of St. Gallen, St. Gallen.
- Schultz, P. 2003, "Pseudo market timing and the long-run underperformance of IPOs", *The Journal of Finance*, vol. 58, no. 2, pp. 483-518.
- Spliid, R. 2013, "Is Nordic Private Equity Different?", *The Journal of Private Equity*, vol. 16, no. 2, pp. 20-37.
- Star, M.G. 2014, " Private Equity Groups Focus On Operations 'To Combat Lean Returns'", *Forbes*, 14 January 2014, viewed 2014-05-15, Available: <http://www.forbes.com/sites/mergermarket/2014/01/14/private-equity-groups-focus-on-operations-to-combat-lean-returns/>
- Sundberg, M. 2013, "Stark börs lockar till nya noteringar", *Dagens industri*, 15 May, pp.9.
- van Frederikslust, R.A. & van der Geest, Roy A 2001, "Initial returns and long-run performance of private equity-backed initial public offerings on the Amsterdam Stock Exchange", Working paper, Rotterdam School of Management.
- Westerholm, P.J. 2006, "Industry clustering in Nordic initial public offering markets", *International Review of Finance*, vol. 6, no. 1-2, pp. 25-41.
- Wienberg, C. 2013, " OW Bunker's \$980 Million IPO Denmark's Second Biggest Since 2010", *Bloomberg*, 28 march 2014, viewed 2014-05-14, Available: <http://www.bloomberg.com/news/2014-03-28/ow-bunker-s-980-million-ipo-denmark-s-second-biggest-since-2010.html>

9 Appendix

Appendix 1 - Firms excluded from initial dataset by reason for excluding

Reason for excluding	Number of IPOs	Percent of total sample
Could not classify	76	13%
Lack of ISIN or SEDOL code	35	6%
Lack of stock data in Datastream	20	3%
Total	131	23%

Appendix 2 - Offer prices in relation to our total sample

	(%)	(%)		
	ALL	NS	VC	BO
1997	29	15	100	50
1998	57	54	100	33
1999	28	29	0	40
2000	69	64	77	50
2001	43	38	100	0
2002	71	0	50	100
2003	20	25	n/a	n/a
2004	31	22	50	100
2005	52	37	88	89
2006	63	56	67	100
2007	63	55	78	100
2008	68	69	50	n/a
2009	70	72	50	n/a
2010	84	79	100	100
Average	58	52	73	75

The table illustrates the number of IPOs in our offer prices sample in relation to the total sample of IPOs in percent. Our total sample is comprised by 443 IPOs, 320 non-sponsored (NS), 70 venture-capital-backed (VC), and 53 buyout-backed (BO). Our offer prices sample is comprised by 166 non-sponsored (NS), 50 venture-capital-backed (VC), and 40 private-equity-backed (BO) IPOs from January 1997 to December 2010. If there were no IPOs in the subgroup that year, it is indicated by n/a.

Appendix 3 - Sample firms

Firm	Year	Country	Subgroup	IPO activity period
1,618 STRICT	2007	Sweden	NS	High
24H MOVIES SWEDEN	2008	Sweden	NS	Medium
24SEVENOFFICE	2007	Norway	VC	High
ABILITY GROUP	2006	Norway	BO	High
ACADEMEDIA	1998	Sweden	NS	Medium
A-COM	1999	Sweden	BO	Medium
ACTIVE CAPITAL	2002	Sweden	NS	Low
ADDTECH	2001	Sweden	NS	Low
ADDVISE INREDNING SKYDDSVENTILATION	1998	Sweden	NS	Medium
ADDYOURLOGO GROUP	2005	Sweden	NS	High
ADERA	1999	Sweden	NS	Medium
ADOBORATOR	2010	Sweden	NS	Medium
ADTAIL	2009	Sweden	NS	Medium
AEROCRINE	2007	Sweden	VC	High
AFFECTOGENIMAP	2005	Finland	BO	High
AFFTECH	2000	Denmark	VC	Medium
AFFÄRSSTRATEGERNA I SVERIGE	1998	Sweden	NS	Medium
AHLSTROM	2006	Finland	NS	High
AKER	2004	Norway	NS	Medium
AKER AMERICAN SHIPPING CORPORATION	2005	Norway	NS	High
AKER DRILLING	2005	Norway	NS	High
AKER EXPLORATION	2007	Norway	NS	High
AKER FLOATING PRODUCTION	2006	Norway	NS	High
AKER KVÆRNER	2004	Norway	NS	Medium
AKER YARDS	2004	Norway	NS	Medium
AKVA GROUP	2006	Norway	VC	High
ALBIN METALS	2008	Sweden	NS	Medium
ALCASTON EXPLORATION	2009	Sweden	NS	Medium
ALDATA SOLUTION	1999	Finland	VC	Medium
ALFA LAVAL	2002	Sweden	BO	Low
ALGETA	2010	Norway	VC	Medium
ALLTELE	2007	Sweden	NS	High
ALM BRAND FORMUE	2003	Denmark	NS	Low
ALPHAHELIX MOLECULAR DIAGNOSTICS	2006	Sweden	VC	High
APL	2007	Norway	VC	High
APPTIX	2002	Norway	VC	Low
AQUA BIO TECHNOLOGY	2008	Norway	NS	Medium
A-RAKENNUMIES	1998	Finland	BO	Medium
ARCHELON MINERAL	2008	Sweden	NS	Medium
ARISE WINDPOWER	2010	Sweden	NS	Medium
ARTIMPLANT	1997	Sweden	VC	Medium
ARTUMAS GROUP	2005	Norway	NS	High
ASPOCOMP GROUP	1999	Finland	NS	Medium
ATLANTIC BOTROLEUM	2006	Denmark	NS	High
AU HOLDING	2005	Sweden	NS	High
AUDIODEV	2000	Sweden	NS	Medium
AURSKOG SPAREBANK	1998	Norway	NS	Medium
AVEGA GROUP	2007	Sweden	NS	High
AWILCO OFFSHORE	2005	Norway	NS	High
AXIS	2000	Sweden	VC	Medium
AXLON GROUP	2004	Sweden	NS	Medium
BADGER EXPLORER	2007	Norway	VC	High
BAHNHOF	2007	Sweden	NS	High
BAKKAFROST P/F	2010	Norway	NS	Medium
BALLINGSLÖV INTERNATIONAL	2002	Sweden	BO	Low
BASIQ NETWORKS BN	2005	Sweden	NS	High
BAVARIAN NORDIC RESEARCH INSTITUTE	1998	Denmark	BO	Medium
BE GROUP	2006	Sweden	BO	High
BENCHMARK OIL & GAS	2006	Sweden	NS	High
BERGEN GROUP	2008	Norway	NS	Medium
BERGESEN WORLDWIDE GAS	2005	Norway	NS	High
BESTIN PREPACKAGED SERVICE SOFTWARE	2008	Sweden	NS	Medium

Firm	Year	Country	Subgroup	IPO activity period
BILLERUD	2001	Sweden	NS	Low
BIOGALA	1998	Sweden	VC	Medium
BIOINVENT INTERNATIONAL	2001	Sweden	VC	Low
BIORA	1997	Sweden	VC	Medium
BIOSENSOR APPLICATIONS SWEDEN	2006	Sweden	NS	High
BIOTEC PHARMACON	2005	Norway	VC	High
BIOTIE THERAPIES	2000	Finland	NS	Medium
BIOVITRUM	2006	Sweden	BO	High
BIRDSTEP TECHNOLOGY	2002	Norway	VC	Low
BJØRGE	2004	Norway	BO	Medium
BJÖRN BORG	2004	Sweden	NS	Medium
BLOCK WATNE GRUPPON ASA	2006	Norway	NS	High
BLUEMARX	2000	Sweden	NS	Medium
BOREVIND	2006	Sweden	NS	High
BOTNIA EXPLORATTON	2009	Sweden	NS	Medium
BRANDWORLD SVERIGE	2010	Sweden	NS	Medium
BRINNOVA FASTIGHETER	2003	Sweden	NS	Low
BROSTRÖM	1998	Sweden	NS	Medium
BYGGMAX GROUP	2010	Sweden	BO	Medium
CAPIO	2000	Sweden	VC	Medium
CARL LAMM	2008	Sweden	VC	Medium
CARL LAMM	2006	Sweden	VC	High
CATENA	2006	Sweden	NS	High
CATERING PLEASE I SKANDINAVIEN	2007	Sweden	NS	High
CAUCASUS OIL	2009	Sweden	NS	Medium
CDON	2010	Sweden	NS	Medium
CELLAVISION	2007	Sweden	NS	High
CELLCURA	2010	Norway	VC	Medium
CENTRAL ASIA GOLD	2005	Sweden	NS	High
CERMAQ	2005	Norway	NS	High
CHEMOMETEC	2006	Denmark	NS	High
CHERRYFÖRETAGEN	2006	Sweden	NS	High
CHR HANSEN HOLDING	2010	Denmark	BO	Medium
CIMBER STERLING GROUP	2009	Denmark	NS	Medium
CLAS OHLSON	1999	Sweden	NS	Medium
CLAVIS PHARMA	2006	Norway	VC	High
CLINICAL LASERTHERMIA SYSTEMS	2009	Sweden	NS	Medium
CLOETTA	2008	Sweden	NS	Medium
COLDATOR FRESHCOOL INTERNATIONAL	2000	Sweden	NS	Medium
COMENDO A/S	2006	Denmark	NS	High
COMFORT WINDOW SYSTEM	2009	Sweden	NS	Medium
COMMUNITY ENTERTAINMENT SVENSKA	2008	Sweden	NS	Medium
COMROD COMMUNICATION	2007	Norway	Ns	High
CONFIDENCE INTERNATIONAL	1998	Sweden	NS	Medium
CONSORTE GROUP	2001	Norway	VC	Low
CREW MINERALS	2006	Norway	NS	High
CTT SYSTEMS	1997	Sweden	NS	Medium
CURERA SVERIGE	2005	Sweden	NS	High
CYBER COM CONSULTING GROUP SCANDINAVIA	1999	Sweden	NS	Medium
D CARNEGIE & CO	2001	Sweden	NS	Low
DANNEMORA MINERAL	2007	Sweden	NS	High
DEEPOCEAN	2005	Norway	NS	High
DEFLAMO	2008	Sweden	NS	Medium
DELTAQ	2007	Denmark	NS	High
DEVICOM	2007	Sweden	NS	High
DGC ONE	2008	Sweden	NS	Medium
DIAMYD MEDICAL	1997	Sweden	NS	Medium
DIBS PAYMENT SERVICES	2007	Sweden	VC	High
DIGIA	1999	Finland	NS	Medium
DIGNITANA	2009	Sweden	NS	Medium
DIÖS FASTIGHETER	2006	Sweden	NS	High
DK TRENDS INVEST	2007	Denmark	NS	High
DO NETWORKS SVERIGE	2007	Sweden	NS	High
DUNI	2007	Sweden	BO	High

Firm	Year	Country	Subgroup	IPO activity period
EAST CAPITAL EXPLORER	2007	Sweden	NS	High
ECORUB	2010	Sweden	NS	Medium
EIDESVIK OFFSHORE	2005	Norway	NS	High
EIK BANKI P/F	2007	Denmark	NS	High
EITZEN CHEMICAL	2006	Norway	NS	High
EKOMARINE	2010	Sweden	NS	Medium
ELECTRA GRUPBON	2006	Sweden	NS	High
ELECTROMAGNETIC GEOSERVICES	2007	Norway	BO	High
ELTEK	1998	Norway	VC	Medium
EMPIRE	2005	Sweden	NS	High
ENIRO	2000	Sweden	NS	Medium
ENJOY GROUP	2007	Sweden	NS	High
EPISURF MEDICAL	2010	Sweden	NS	Medium
ERIKSSON DEVELOPMENT AND INNOVATION CO	2008	Sweden	NS	Medium
ERRIA	2007	Denmark	NS	High
EUROCINE VACCINES	2006	Sweden	VC	High
EUROCON CONSULTING	2007	Sweden	NS	High
EWORK SCANDINAVIA	2008	Sweden	NS	Medium
EXINI DIAGNOSTICS A	2009	Sweden	NS	Medium
EXIQON	2007	Denmark	VC	High
EXPLORATION RESOURCES	2005	Norway	NS	High
FARA	2005	Norway	NS	High
FAST SEARCH & TRANSFER	2001	Norway	NS	Low
FINDADS	2010	Sweden	NS	Medium
FIRSTFARMS	2006	Denmark	NS	High
FLEX LNG	2009	Norway	NS	Medium
FLOATEL INTERNATIONAL	2010	Norway	NS	Medium
FORESLIGHT STUDIO	2008	Sweden	NS	Medium
FORMUEEVOLUTION L	2008	Denmark	NS	Medium
FORMUEEVOLUTION LI	2008	Denmark	NS	Medium
FORTUM	1998	Finland	NS	Medium
FOTOQUICK	2005	Sweden	NS	High
FRAMFAB	1999	Sweden	NS	Medium
FRIGSTAD DISCOVERER INVEST	2007	Norway	NS	High
FUNCOM	2005	Norway	VC	High
FØROYA BANKI P/F	2007	Denmark	NS	High
G5 ENTERTAINMENT	2008	Sweden	NS	Medium
GANT	2006	Sweden	BO	High
GENERIC	2006	Sweden	VC	High
GENESIS IT	2010	Sweden	NS	Medium
GENLINE	2004	Sweden	NS	Medium
GENMAB	2000	Denmark	VC	Medium
GEO	2005	Norway	NS	High
GIFTTODAY SWEDEN	2008	Sweden	NS	Medium
GJENSIDIGE NOR	2010	Norway	NS	Medium
GLOBAL IP SOLUTIONS (GIPS)	2008	Norway	VC	Medium
GLOBALFUN	2008	Sweden	NS	Medium
GOLAR LNG ENERGY	2009	Norway	NS	Medium
GOLDEN OCEAN GROUP	2004	Norway	NS	Medium
GRENLAND GROUP	2005	Norway	BO	High
GRIEG SEAFOOD	2007	Norway	NS	High
GRIFFIN III BERLIN	2007	Denmark	NS	High
GUDME RAASCHOU VISION	2003	Denmark	NS	Low
GULD INVEST NORDEN	2008	Sweden	NS	Medium
GUNNEBO INDUSTRIER	2005	Sweden	NS	High
H LUNDBECK	1999	Denmark	NS	Medium
H1 COMMUNICATION	2008	Sweden	VC	Medium
HAFSLUND INFRATEK	2007	Norway	NS	High
HAKON INVEST	2005	Sweden	NS	High
HAMMAR INVEST	2007	Sweden	NS	High
HAMMARBY BANDY	2008	Sweden	NS	Medium
HARTELEX	2010	Sweden	NS	Medium
HEMTEX	2005	Sweden	BO	High
HEXPOL	2008	Sweden	NS	Medium

Firm	Year	Country	Subgroup	IPO activity period
HJELLEGERDE	1997	Norway	NS	Medium
HMS NETWORKS	2007	Sweden	BO	High
HOL SPAREBANK	1998	Norway	NS	Medium
HOMEMAID	2005	Sweden	NS	High
HUMAN CARE HC	2000	Sweden	NS	Medium
INDUSTRIAL & FINANCIAL SYSTEMS	1997	Sweden	NS	Medium
INDUTRADE	2005	Sweden	NS	High
INNATE PHARMACEUTICALS	2004	Sweden	NS	Medium
INTERNATIONAL GOLD EXPLORATION IGE	1997	Norway	NS	Medium
INTERNATIONAL MARITIME EXCHANGE	2005	Norway	VC	High
INTEROIL EXPLORATION AND PRODUCTION	2006	Norway	NS	High
INTRUM JUSTITIA	2002	Sweden	BO	Low
INVESTEIA SWEDEN PROBORTIES	2008	Denmark	NS	Medium
INVIK & CO	2005	Sweden	NS	High
INVIVOSENSE	2007	Norway	VC	High
IRONROAD	2010	Sweden	NS	Medium
ISCONOVA	2010	Sweden	VC	Medium
ITAB INREDNING	2004	Sweden	NS	Medium
ITERA	1999	Norway	NS	Medium
JAAKKO PÖYRY GROUP	1997	Finland	NS	Medium
JAMES CONCEPTS	2007	Sweden	NS	High
JAYS	2010	Sweden	VC	Medium
JELLO	2005	Sweden	NS	High
JOJKA COMMUNICATIONS	2007	Sweden	NS	High
JUNEBUD	2009	Sweden	NS	Medium
KAPPAHL	2006	Sweden	BO	High
KARLSHAMN	2005	Sweden	BO	High
KARO BIO	1998	Sweden	VC	Medium
KAROLIN MACHINE TOOL	1998	Sweden	NS	Medium
KEMIRA GROWHOW	2004	Finland	NS	Medium
KLICK DATA	2004	Sweden	NS	Medium
KLIMAINVEST	2007	Denmark	NS	High
KLIMAX	2009	Sweden	NS	Medium
KONE	2005	Finland	NS	High
KONGSBERG AUTOMOTIVE HOLDING	2005	Norway	BO	High
KOPPARBERG MINERAL	2007	Sweden	NS	High
LABS2GROUP	1997	Sweden	NS	Medium
LAPPLAND GOLDMINERS	2004	Sweden	NS	Medium
LAYERLAB	2010	Sweden	VC	Medium
LIFECYCLE PHARMA	2006	Denmark	VC	High
LINDAB INTERNATIONAL	2006	Sweden	BO	High
LINKMED	2006	Sweden	NS	High
LOOMIS	2008	Sweden	NS	Medium
LOVISAGRUVAN	2007	Sweden	NS	High
LUNCHEXPRESS I SVERIGE	2010	Sweden	NS	Medium
LUXO	1998	Norway	BO	Medium
LYYN	2010	Sweden	NS	Medium
MABI RENT	2010	Sweden	NS	Medium
MACONOMY	2000	Denmark	VC	Medium
MAMUT	2004	Norway	VC	Medium
MARIMEKKO	1999	Finland	NS	Medium
MEDICBON	2006	Sweden	NS	High
MEDIROX	1998	Sweden	NS	Medium
MENNTA SVERIGE	2006	Sweden	NS	High
METRO INTERNATIONAL	2000	Sweden	NS	Medium
MICRO SYSTEMATION	1999	Sweden	NS	Medium
MICRONIC LASER SYSTEMS	2000	Sweden	VC	Medium
MICROPOS MEDICAL	2009	Sweden	VC	Medium
MICUS	2010	Sweden	NS	Medium
MINERAL INVEST INTERNATIONAL MII	2010	Sweden	NS	Medium
MIRIS HOLDING	2006	Sweden	NS	High
MOBILE BUSINESS CHALLENGER MBC	2010	Sweden	NS	Medium
MOBWATCHER	2007	Sweden	VC	High
MORPHIC TECHNOLOGIES	2004	Sweden	VC	Medium

Firm	Year	Country	Subgroup	IPO activity period
MORPOL	2010	Norway	NS	Medium
MQ HOLDING	2010	Sweden	BO	Medium
MUNTERS	1997	Sweden	NS	Medium
MYSKOOP INTERNATIONAL	2007	Sweden	NS	High
NATTOPHARMA	2008	Norway	NS	Medium
NAVAMEDIC	2006	Norway	NS	High
NAXS NORDIC ACCESS BUYOUT FUND	2007	Sweden	NS	High
NEAS	2007	Norway	BO	High
NEDERMAN	2007	Sweden	BO	High
NET ENTERTAINMENT	2007	Sweden	NS	High
NET GAMING EUROBO	2009	Sweden	NS	Medium
NEUROVIVE PHARMACEUTICAL	2008	Sweden	NS	Medium
NEW NORMAN	1997	Norway	NS	Medium
NEW RIEBER SHIPPING	1998	Norway	NS	Medium
NEW SCIENCE SVENSKA	2004	Sweden	NS	Medium
NEW WAVE GROUP	1997	Sweden	NS	Medium
NEXCITE	2004	Sweden	NS	Medium
NEXTGENTEL HOLDING	2003	Norway	VC	Low
NOBIA	2002	Sweden	BO	Low
NOCOM	1999	Sweden	NS	Medium
NORDIAG	2005	Norway	VC	High
NORDIC CAMPING & SPORTS	2006	Sweden	NS	High
NORDIC MINES	2006	Sweden	NS	High
NORDIC MINING	2007	Norway	NS	High
NORDIC SERVICE PARTNERS HOLDING	1998	Sweden	VC	Medium
NORDIC TANKERS	2007	Denmark	NS	High
NORGANI HighELS	2005	Norway	NS	High
NORWAY BOLAGIC	2008	Norway	NS	Medium
NORWEGIAN AIR SHUTTLE	2003	Norway	NS	Low
NORWEGIAN ENERGY COMPANY	2007	Norway	BO	High
NORWEGIAN PROBORTY	2006	Norway	NS	High
NOTE	2004	Sweden	NS	Medium
NOVOTEK	1999	Sweden	NS	Medium
NOVOZYMES	2000	Denmark	VC	Medium
NOVUS GROUP INTERNATIONAL	2007	Sweden	NS	High
NUNAMINERALS	2008	Denmark	NS	Medium
OASMIA PHARMACEUTICAL	2007	Sweden	NS	High
OCEANTEAM POWER & UMBILICAL	2007	Norway	NS	High
ODD MOLLY INTERNATIONAL	2007	Sweden	NS	High
ODIM	2005	Norway	BO	High
OHI	2001	Norway	BO	Low
OLICOM	1997	Denmark	NS	Medium
ONE MEDIA HOLDING	2004	Sweden	NS	Medium
ONE MEDIA HOLDING	2004	Sweden	NS	Medium
OBORA SOFTWARE	2004	Norway	VC	Medium
OPTOVENT	1998	Sweden	NS	Medium
OPUS PRODOX	2006	Sweden	NS	High
ORC SOFTWARE	2000	Sweden	NS	Medium
OREXO	2005	Sweden	VC	High
ORIFLAME COSMETICS	2004	Sweden	BO	Medium
ORIOLA-KD	2006	Finland	NS	High
OUTOKUMPU TECHNOLOGY	2006	Finland	NS	High
PANDORA	2010	Denmark	BO	Medium
PANORO ENERGY	2010	Norway	NS	Medium
PARANS SOLAR LIGHTING	2010	Sweden	NS	Medium
PCI BIOTECH HOLDING	2008	Norway	VC	Medium
PCQT	2005	Sweden	NS	High
BOAB INDUSTRI	2007	Sweden	NS	High
BORLOS	1999	Finland	BO	Medium
BOTROJACK	2005	Norway	NS	High
BOTROJARL	2006	Norway	NS	High
PHARMALUNDENSIS	2010	Sweden	NS	Medium
PHighOCURE	2000	Norway	NS	Medium
PKC GROUP	1997	Finland	BO	Medium

Firm	Year	Country	Subgroup	IPO activity period
POLARIS MEDIA	2008	Norway	NS	Medium
POLIMOON	2005	Norway	BO	High
POLYPLANK	2005	Sweden	NS	High
POWEL	2005	Norway	VC	High
PROCAST MEDIA	2009	Sweden	NS	Medium
PROFFICE	1999	Sweden	BO	Medium
PRONOVA BIOPHARMA	2007	Norway	BO	High
PROSAFE PRODUCTION PUBLIC	2008	Norway	NS	Medium
PYROSEQUENCING	2000	Sweden	VC	Medium
Q-MED	1999	Sweden	VC	Medium
READSOFT	1999	Sweden	VC	Medium
RELATION & BRAND	2006	Sweden	NS	High
RELLA HOLDING	2006	Denmark	NS	High
REM OFFSHORE	2007	Norway	NS	High
REMEDIAL (CYPRUS) PUBLIC COMPANY	2008	Norway	NS	Medium
RENEWABLE ENERGY CORPORATION	2006	Norway	VC	High
REPANT	2007	Norway	NS	High
RESERVOIR EXPLORATION TECHNOLOGY	2006	Norway	NS	High
REVENIO GROUP	2000	Finland	VC	Medium
REVUS ENERGY	2005	Norway	BO	High
REZIDOR HighEL GROUP	2006	Sweden	NS	High
RNB RETAIL AND BRANDS	2001	Sweden	NS	Low
ROMREAL	2007	Norway	NS	High
ROXI STENHUS GRUPBON	2005	Sweden	NS	High
SAGAX	1999	Sweden	NS	Medium
SALCOMP	2006	Finland	BO	High
SALMAR	2007	Norway	NS	High
SATAMA INTERACTIVE	2000	Finland	VC	Medium
SCAN GEOPHYSICAL	2007	Norway	BO	High
SCAN SUBSEA	2007	Norway	NS	High
SCANDINAVIAN PRIVATE EQUITY	2007	Denmark	NS	High
SCANDINAVIAN PROBORTY DEVELOPMENT	2007	Norway	NS	High
SCANDINAVIAN RETAIL GROUP	1998	Norway	BO	Medium
SCIROCCO	2006	Sweden	NS	High
SCORPION OFFSHORE	2005	Norway	NS	High
SCOTTISH SALMON COMPANY	2010	Norway	NS	Medium
SEABIRD EXPLORATION	2006	Norway	NS	High
SEAWELL LTD	2010	Norway	NS	Medium
SECTRA	1999	Sweden	NS	Medium
SECURITAS DIRECT	2006	Sweden	NS	High
SECURITAS SYSTEMS	2006	Sweden	NS	High
SELENA OIL & GAS HOLDING	2004	Sweden	NS	Medium
SENSODETECT	2009	Sweden	NS	Medium
SENZIME	2008	Sweden	NS	Medium
SIMRAD OPTRONICS	2005	Norway	NS	High
SIMTRONICS	2007	Norway	NS	High
SOFRONIC	1998	Sweden	NS	Medium
SOLSTAD OFFSHORE	1997	Norway	NS	Medium
SONG NETWORKS	2000	Sweden	BO	Medium
SPAREKASSEN HIMMERLAND	2006	Denmark	NS	High
SPB.1 OSTFOLD AKRS	2005	Norway	NS	High
SBOCTRUM	2008	Norway	NS	Medium
SPITS	2006	Norway	NS	High
SPORTJOHAN	2010	Sweden	NS	Medium
SSH COMMUNICATIONS SECURITY	2000	Finland	NS	Medium
STAR VAULT	2007	Sweden	NS	High
STATOIL	2001	Norway	NS	Low
STATOIL FUEL & RETAIL	2010	Norway	NS	Medium
STEPSTONE	2000	Norway	VC	Medium
STORM REAL ESTATE	2010	Norway	NS	Medium
STORMFÄGELN	2005	Sweden	NS	High
STRATEGIC INVS	2001	Denmark	BO	Low
STUDSVIK	2001	Sweden	BO	Low
SUOMINEN YHTYMÄ	2001	Finland	NS	Low

Firm	Year	Country	Subgroup	IPO activity period
SVEDBERGS I DALSTORP	1997	Sweden	NS	Medium
SWEDE RESOURCES	2005	Sweden	NS	High
SWEDOL	2006	Sweden	NS	High
SVITHOID TANKERS	2004	Sweden	NS	Medium
SYNNØVE FINDEN MEIERIER	1998	Norway	BO	Medium
SYSTEMAIR	2007	Sweden	NS	High
SYSTEMSEPARATION SWEDEN HOLDING	2004	Sweden	VC	Medium
TALVIVAARAN KAIVOSOSAKEYHTIÖ	2007	Finland	VC	High
TANDBERG TECHNOLOGY	2009	Sweden	VC	Medium
TECHNOPOLIS	1999	Finland	NS	Medium
TELELOGIC	1999	Sweden	BO	Medium
TELENOR	2000	Norway	NS	Medium
TELESTE	1999	Finland	BO	Medium
TELIA	2000	Sweden	NS	Medium
TELIGENT	1999	Sweden	NS	Medium
TELIO HOLDING	2006	Norway	NS	High
TETHYS OIL	2004	Sweden	NS	Medium
THALAMUS NETWORKS	2000	Sweden	NS	Medium
THENBERG & KINDE FONDKOMMISSION	2009	Sweden	NS	Medium
THRANE & THRANE	2001	Denmark	Ns	Low
TICKET TRAVEL GROUP	1997	Sweden	BO	Medium
TIGRAN TECHNOLOGIES	2008	Sweden	NS	Medium
TIKKURILA	2010	Finland	NS	Medium
TILGIN	2006	Sweden	NS	High
TOPOTARGET	2005	Denmark	VC	High
TRACTECHOLOGY	2005	Sweden	NS	High
TRADEDOUBLER	2005	Sweden	VC	High
TRAVEAS	2009	Sweden	NS	Medium
TREFOIL	2005	Norway	NS	High
TRETTI	2005	Sweden	NS	High
TRIGON AGRI	2007	Sweden	NS	High
TROLLTECH	2006	Norway	VC	High
TRUE HEADING	2010	Sweden	NS	Medium
TRYGVESTA	2005	Denmark	NS	High
UNIFLEX	2004	Sweden	NS	Medium
UTFORS	2000	Sweden	BO	Medium
VACON	2000	Finland	NS	Medium
VALUETREE	2008	Sweden	NS	Medium
WATERJET SWEDEN	2007	Sweden	NS	High
WEGA MINING	2007	Norway	BO	High
VENDATOR	2010	Sweden	NS	Medium
WEST SIBERIAN RESOURCES	2000	Sweden	VC	Medium
VESTAS WIND SYSTEMS	1998	Denmark	BO	Medium
VIA TRAVEL GROUP	2005	Norway	BO	High
VIATECH SYSTEMS	2005	Sweden	NS	High
VIBORG HÅNDBOLD KLUB	1999	Denmark	NS	Medium
WHLBORGS FASTIGHETER	2005	Sweden	NS	High
WIKING MINERAL	2006	Sweden	NS	High
VIKING TELECOM	2000	Sweden	VC	Medium
WILH WILHELMSSEN	2010	Norway	NS	Medium
WILSON	2005	Norway	NS	High
VITA NOVA VENTURES	2004	Sweden	NS	Medium
VITROLIFE	2001	Sweden	VC	Low
WNTRESEARCH	2010	Sweden	NS	Medium
VOSTOK NAFTA INVESTMENT	2007	Sweden	NS	High
VÄRMLANDS FINANS SVERIGE	2008	Sweden	NS	Medium
XRF ANALYTICAL	2007	Sweden	NS	High
XTRACOM	2005	Sweden	NS	High
XTRACOM CONSULTING	2008	Sweden	NS	Medium
YARA INTERNATIONAL	2004	Norway	NS	Medium
ZEALAND PHARMA	2010	Denmark	VC	Medium

Appendix 4 - Mean Buy-and-hold abnormal returns in Event time

Months	Equal Weighted (%)				Value Weighted (%)			
	ALL	NS	VC	BO	ALL	NS	VC	BO
<i>Panel A. MSCI Nordics</i>								
6	-0.56	-1.10	4.48	-4.36	3.07	4.32	12.22	-9.65
12	4.73	1.58	9.21	17.99	9.19	11.71	30.63	-18.47
24	-2.64	-10.31	23.79	7.08	9.32	11.90	20.69	-11.52
36	-1.92	-4.79	3.23	6.12	23.59	31.62	-4.02	4.27
<i>Panel B. SBM</i>								
6	-0.64	-0.79	3.24	-5.11	6.12	7.88	14.43	-8.41
12	4.76	2.18	8.57	15.48	12.74	16.17	32.71	-18.22
24	-1.42	-7.66	22.52	3.34	15.33	19.38	22.15	-9.30
36	-4.94	-6.98	13.29	-2.87	27.64	35.72	-14.78	9.31

The total sample of 443 IPOs is comprised by 320 non-sponsored (NS), 70 venture-capital-backed (VC), and 53 private-equity-backed (BO) IPOs from January 1997 to December 2010 on any of the Nordic stock exchanges. For each IPO, the buy-and-hold abnormal return are calculated by compounding monthly returns for 6, 12, 24 and 36 months. If the IPO is delisted before the 36th month, returns are compounded until the delisting date. Panel A presents the equal- and value-weighted buy-and-hold abnormal returns using the MSCI Nordic Index. Value-weights are based on inflation adjusted market capitalisation at time of entering aftermarket performance period, exactly one calendar month after the IPO. Panel B reports equivalent buy-and-hold abnormal returns using our self-constructed SBM benchmark

Appendix 5 - Mean Cumulative abnormal returns in Event time

Months	Equal Weighted (%)				Value Weighted (%)			
	ALL	NS	VC	BO	ALL	NS	VC	BO
<i>Panel A. MSCI Nordics</i>								
6	-2.87	-3.68	4.16	-7.87	0.44	1.21	9.81	-10.08
12	-0.66	-1.39	5.21	-4.07	5.18	11.61	8.81	-28.64
24	-5.04	-7.15	16.68	-23.03	-3.08	0.13	29.10	-42.06
36	-7.02	-5.87	0.06	-25.15	10.99	19.65	11.79	-31.79
<i>Panel B. SBM</i>								
6	-2.19	-1.97	1.00	-8.09	4.95	6.69	12.10	-8.69
12	-1.13	-1.33	2.46	-4.91	11.14	19.08	11.54	-27.63
24	-3.55	-4.47	14.60	-23.85	9.11	15.35	33.72	-39.04
36	-5.33	-3.37	-0.65	-24.88	24.92	35.15	21.60	-22.42

The total sample of 443 IPOs is comprised by 320 non-sponsored (NS), 70 venture-capital-backed (VC), and 53 private-equity-backed (BO) IPOs from January 1997 to December 2010 listed on any of the Nordic stock exchanges. For each IPO, the cumulative abnormal return are calculated by compounding monthly returns for 6, 12, 24 and 36 months. If the IPO is delisted before the 36th month, returns are calculated until the delisting date. Panel A presents the equal- and value-weighted cumulative abnormal returns using the MSCI Nordic Index. Value-weights are based on inflation adjusted market capitalisation at time of entering aftermarket performance period, exactly one calendar month after the IPO. Panel B reports equivalent cumulative abnormal returns using our self-constructed SBM benchmark