Aku Kortemaa

Impact of Multiple Lead Underwriters on the Aftermarket Performance of Nordic Initial Public Offerings

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TIIVISTELMÄ:

Tämä työ tutkii Tanskassa, Suomessa, Norjassa ja Ruotsissa vuosien 1999 ja 2015 välillä listautuneiden yritysten suoriutumista osakemarkkinoilla ja sitä minkälainen vaikutus siihen on prosessiin osallistuneiden listautumisannin pääjärjestäjien lukumäärällä. Tätä tavoitetta motivoivat hiljattain Yhdysvalloissa tehdyt löydökset, jotka osoittavat, että järjestäjistä koostuvat syndikaatit ovat käyneet läpi rakenteellisen muutoksen. Tämä tarkoittaa sitä, että sellaisten listautumisantien osuus, joissa on mukana useampi pääjärjestäjä, on kasvanut huomattavasti vuosituhannen vaihteen jälkeen. Vielä tärkeämpi havainto on kuitenkin se, että Yhdysvalloissa tällä rakennemuutoksella on ollut vaikutusta myös suoriutumiseen jälkimarkkinoilla, sillä tällaiset usean eri toimijan vastuulla olevat listautumisannit ovat vähemmän alihinnoiteltuja ja tuottavat paremmin pitkällä tähtäimellä, kuin sellaiset yritykset, joiden taustalla on perinteisemmän mallin mukaisesti ollut ainoastaan yksi pääjärjestäjä.

Tässä työssä suoriutuminen jälkimarkkinoilla jaetaan vakiintuneen käytännön mukaisesti lyhyen ja pitkän aikavälin suoriutumiseen, minkä taustalla on kaksi syytä. Ensinnäkin, aiemmat tutkimukset ovat osoittaneet, että listautumisannit ovat usein aluksi alihinnoiteltuja, mikä tarkoittaa sitä, että sijoittajien on mahdollista saavuttaa merkittäviä tuottoja ensimmäisen kaupankäyntipäivän aikana. Toinen syy on se, että listautumisantien on kuitenkin havaittu olevan huonoja pitkän aikavälin sijoituksia, sillä ne häviävät selvästi vertailukohteilleen. Tutkimustulokset osoittavat, että ensimmäisen päivän tuotto on ollut Pohjoismaissa keskimäärin 9 %, mikä viittaa siihen, että ne ovat alun perin hinnoiteltu lähemmäksi todellista arvoaan kuin Yhdysvalloissa, missä vastaava luku on ollut historiallisesti noin 18 %. Tulokset myös paljastavat sen, että pohjoismaiset listautumisannit suoriutuvat yllättävän hyvin myös pitkällä tähtäimellä, sillä keskimääräinen 3 vuoden BHAR-menetelmällä mitattu tuotto MSCI Europe -tuottoindeksiä vastaan oli 5.8 %, mediaanin ollessa -11.3 %. Tarkempi analyysi kuitenkin paljastaa, että näihin tuloksiin vaikuttavat erityisesti ruotsalaisten yhtiöiden listautumisannit, jotka suoriutuvat paljon paremmin kuin muut pohjoismaiset yhtiöt.

Tulokset näyttävät myös sen, että tyypillinen listautumisannin pääjärjestäjien lukumäärä on kasvanut Yhdysvaltojen tapaan myös Pohjoismaissa, sillä vuonna 2015 78 % kaikista listautumisista oli sellaisia, joissa oli mukana useampi pääjärjestäjä, kun vastaava luku vuonna 1999 oli ainoastaan 33 %. Merkittävin ero tuloksissa on kuitenkin se, että Pohjoismaissa syndikaatin koko vaikuttaa regressiomallien mukaan positiivisesti ainoastaan pitkän aikavälin suoriutumiseen, sillä ne eivät paljasta vastaavaa tilastollisesti merkittävää vaikutusta lyhyen tähtäimen alihinnoitteluun ja näin ollen rakenteellisen muutoksen vaikutus ei ole ollut yhtä suuri kuin Yhdysvalloissa.

AVAINSANAT: Alihinnoittelu, BHAR, Listautumisanti, Pohjoismaat, Pääjärjestäjä

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1 Introduction

This study analyses companies that conducted an initial public offering in Denmark, Finland, Norway and Sweden between the years 1999 and 2015. Initial public offering also known as IPO is a type of public offering where the shares of a company are sold for the first time to the public. Going public benefits companies in many ways, for example, it offers new possible sources of capital and makes the stocks of these companies much more liquid. However, there are also disadvantages associated with IPO since the costs of going public are high and the company loses its privacy. Therefore, whether or not going public is a very important decision and it has a significant impact on the future of these companies. (Pagano, Panetta & Zingales, 1998.)

After the decision about going public has been done the management of the company starts to work with at least one investment bank that manages the IPO process. Those investment banks are called underwriters, and it is common that particularly the large IPOs are managed by a syndicate that consists of several underwriters (Berk & DeMarzo, 2017, p. 873–876). More importantly, there has been a major change in the favored lead underwriter syndicate structure after the turn of the millennium because the study of Vithanage, Neupane & Chung (2016, p. 197) reports that in the U.S. the share of IPOs managed by multiple lead underwriters (MLUs) has jumped from 6% in 1999 to 93% in 2012. This study reveals that there has been a similar trend in the Nordic countries since while in 1999 only 33% of IPOs were MLUs the corresponding figure in 2015 was 78%.

In general, academic literature divides the aftermarket performance of IPOs into two parts. The first one is the short-term performance which is the return achieved during the first trading day, also known as an initial return. It is documented by several studies such as Ritter (1991) that IPOs are often underpriced during the offering which means that investors can achieve significant initial returns. The average initial return in the U.S. has been approximately 18% between 1980 and 2019 (Ritter, 2020) but the examination of the data used in this study reveals that Nordic IPOs have less underpricing than their

U.S. counterparts since the average initial return between 1999 and 2015 for the full sample that comprises 291 companies is only 9%. Despite of this, it seems that there is also a vast amount of money “left on the table” in Nordic countries which means that proceeds gained by issuing companies are significantly smaller than they potentially could have been.

The second one is the long-term performance which is typically measured by 36-month buy-and-hold abnormal return (BHAR) against various benchmark indices and Ritter (1991) shows that in the long-run IPOs are often overpriced rather than underpriced because they significantly underperform their group of matching firms during this three-year buy-and-hold period. This phenomenon has been later documented in several studies since for example, Loughran and Ritter (1995, p. 46) report that during a five-year period, a strategy of investing in IPOs yields 7% less per year than investing in non-issuing companies with approximately the same market capitalization. However, the results of this study suggest that the long-term performance of Nordic IPOs is not nearly as weak, and it is highly dependent on whether we use average or median BHARs.

Vithanage et al. (2016) concentrate on the influence of multiple lead underwriters to the performance of U.S. IPOs that went public between 1999 and 2012 and their findings support a certification hypothesis which suggests that offerings managed by more than one lead underwriters are priced closer to their intrinsic value, have lower and less volatile initial returns and have better long-term performance. Therefore, the goal of this study is to find out if the structural change in lead underwriter syndicates has had a similar impact on the performance of Nordic IPOs. The main results indicate that there are differences between SLU and MLU IPOs and that the impact of the syndicate structure varies between countries since while in general the number of lead underwriters seems to be positively correlated with the long-term performance, in Finland the situation is the opposite and MLUs actually have lower 36-month BHAR than offerings managed only by one lead underwriter.

1.1 Purpose of the study and limitations

This paper examines the role of the underwriters in IPO underpricing and poor long-term performance in Nordic countries and especially aims to reveal whether the involvement of multiple lead underwriters has any major impact. The main goal is to find out if the pattern is similar to the one reported in the United States by the study of Vithanage et al. (2016) where the proportion of multiple lead underwriter IPOs has significantly increased during the last twenty years which has also affected the aftermarket performance of these companies.

Research problem for this study is following:

"Does the number of lead underwriters involved in the initial public offering affect its aftermarket performance?"

Hypotheses for this study are following:

H1 "Nordic IPOs with multiple lead underwriters have less underpricing than the ones managed by only one lead underwriter."

H2 "The number of lead underwriters involved in the offering has a positive relationship with the long-term performance of Nordic IPOs."

1.2 Structure of the study

This paper is divided into eight chapters. The introductory chapter gives a brief overview of this study while the next chapter provides general information about initial public offerings and underwriters. For example, lists the most common reasons why companies want to go public, but also on the other hand, what are the disadvantages of this

decision. The third provides an overview about the IPO underpricing phenomenon and how it can be possibly affected by the underwriters while the fourth chapter is otherwise very similar, but it is concentrated on the long-term performance of IPOs. The fifth chapter presents the data and methodology used in this paper, while chapters six and seven comprise the main empirical part since they analyse the short- and long-term performance of Nordic IPOs and whether or not the size of the lead underwriter syndicate has an effect on them. Finally, the results of this paper are presented in the concluding chapter number eight.

2 Initial public offerings

According to Benveniste, Busaba and Wilhelm (2002, p. 62) IPO is potentially the most important public information event in the lifespan of a company since it is the start of proper two-way information sharing between insiders and outsiders of the firm. Since IPO is the first issue of shares to the general public, it is therefore also the first time when the shares of the firm are available to all potentially interested investors.

There are two different kinds of shares of common stock sold in the IPO, which are primary and secondary shares. The stocks offered in primary offerings are called primary shares and are newly issued shares of common stock, whereas secondary shares are provided by current shareholders of the company (Berk & DeMarzo, 2017, p. 873). Therefore, the most significant difference between these two share types is that the total number of shares is not increasing when there are secondary shares offered. In some cases, it might be possible that secondary offerings are a warning sign among investors because current shareholders are selling their shares away. For example, Brau, Li & Shi (2007) examine whether or not secondary shares hurt aftermarket performance, and findings of their paper indicate that in general, secondary sales are not correlated with poor aftermarket performance, but shares sold by information-advantaged insiders such as officers are. Of course, that is not always the case since according to Berk & DeMarzo (2017, p. 872) there are two primary ways for profits to be realized from investments in private companies. The first one is an acquisition and the second one an IPO. Therefore, selling secondary shares during IPO can also be considered as a natural act of investors.

The volume of IPOs has not been stable over time since it tends to vary significantly which is driven by multiple different reasons. Probably the most well-known example of an extraordinary active IPO market is the turn of the millennium when stocks markets experienced the dot-com bubble. It is a term used to describe an era in the late 90s when so-called internet companies started to become extremely popular and many of them

went public which led to a remarkable rise in the number of IPOs around the world. (Ghosh, 2006.) This is demonstrated by the figure 1 since, while the average annual number during this 40-year period has been approximately 215, annual figures were over three times larger during the most over-optimistic years before the burst of the bubble.

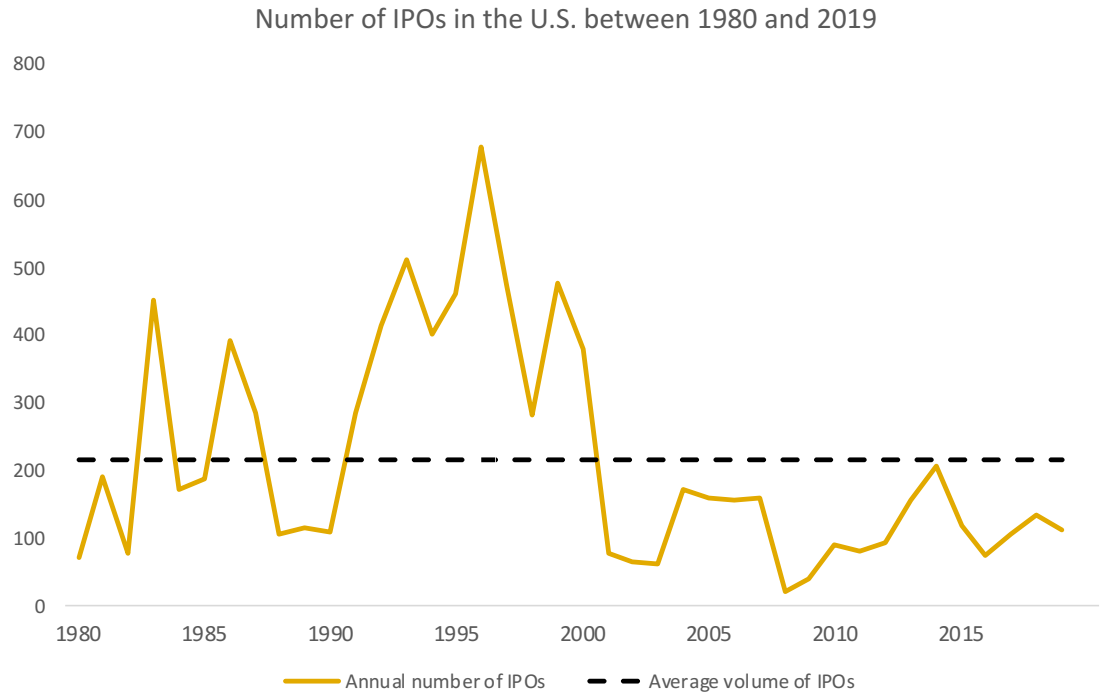

Figure 1. IPO volume in the U.S. between 1980 and 2019 (Ritter, 2020).

2.1 Underwriter syndicate

After the decision about going public has been made, management of the company starts to work together with an underwriter, an investment bank that is managing the whole IPO process. There can be multiple underwriters working with one IPO, and especially in the large offerings, it is common that there is a syndicate formed by a group of investment banks. (Berk & DeMarzo, 2017, p. 875). The syndicate forming process starts when the lead underwriter is chosen by the issuing company, and if many investment banks are interested in becoming the lead underwriter, some of them are likely selected to be co-managers of the syndicate. The company benefits from co-managers for many

reasons. For example, they provide more analyst coverage, new distribution channels for the shares, and also more market making. After the selection of co-managers has been done, non-managing syndicate members are chosen by the issuing company with the help of the lead underwriter. The role of non-managing members is not as significant as co-managers or the lead underwriter, but they are also considerably cheaper to hire. (Corwin & Schultz, 2005, p. 445–446.)

According to the study of Vithanage, Neupane & Chung (2016, p. 195), the current situation where it is common to have multiple lead underwriters is a relatively new phenomenon since this kind of syndicates were in practice non-existent in the U.S before 1999. Their study analyses companies that went public in the U.S. between the years 1999 and 2012 and reveals that multiple lead underwriter syndicates, also called MLUs, have several advantages compared to more traditional offerings with single lead underwriter (SLUs). Their findings are presented later in this study under chapters three and four which introduce previous findings of the relationship between lead underwriters and long- and short-term performance of IPOs.

2.2 Why companies go public

It is widely documented that the number of IPOs is highly cyclical and thus during some periods there are hundreds of new issues while sometimes there are only a handful of IPOs per year (Lowry, 2003). Pagano, Panetta & Zingales (1998) examine the determinants of IPOs in Italy, and according to their study, the decision of whether or not to go public is one of the most significant questions in corporate finance, but despite that it has not been studied enough. According to Jain and Kini (1999, p. 1281–1283), it is challenging to find one general answer to why companies are going public since there are several controversial studies on this subject. One of the most common explanations is that the initial public offering is an established practice and hence a natural stage in the growth of a successful company. However, it is reminded by Pagano et al. (1998) that

there are many large private companies all around the world, especially outside the United States, so there has to be also other incentives to get listed.

Advantages of going public

There are numerous different advantages associated with going public, and there is a comprehensive list of them created by Pagano et al. (1998, p. 38–42). The first benefit of going public is the *better access to the alternative sources of finance* since private companies are often dependent on external funding offered by banks and venture capitalists and hence the possibility to raise capital from public markets is a significant advantage. Their study assumes that this benefit is especially valued by growth companies with high investment rate and high leverage. The second benefit listed by their study is the *stronger bargaining power with banks* since after going public, the funding offered by financial institutions is facing an alternative competitor from the public market (Rajan, 1992) which means that there is more, and also cheaper capital available to publicly listed companies.

The third benefit that is documented is the *greater liquidity of company's stock* and also that *the diversification made by current shareholders is easier and more cost-effective* in public companies. This is because shares of a publicly-traded company can be traded on organized exchanges such as Nasdaq and therefore it can be expected that riskier firms are more interested in going public. This theory is also supported by the study of Brau and Fawcett (2006) where 336 chief financial officers (CFOs) were surveyed since their answers point out that the most important reason for going public is to create public shares for use in future acquisitions. This is partially contradictory with previous IPO literature since according to Brau and Fawcett (2006, p. 400) the most common textbook explanations such as cheaper capital or pecking order in financing are not so important for CFOs.

The fourth advantage listed by Pagano et al. (1998) is *monitoring* which is driven by the fact that there is a robust managerial discipline system offered by the stock market which enables the managers of the company to be more efficiently monitored by shareholders and hence improves the transparency between owners and management. The fifth benefit is *investor recognition* which is important since the portfolio of a regular investor is often very concentrated. In other words, many companies are ignored or not even recognized by investors since there is no sufficient information easily available about them. The process of going public is significantly reducing this problem since more information about the company is provided to the investors (Merton, 1987). The sixth benefit that is highlighted is the *change of control*. According to Zingales (1995), the IPO process can be used as a mechanism to change the ownership structure of the company and maximize its value. Behavior like this can be considered as a logical move by initial owners who are interested in selling their shares.

The final benefit of going public is taking advantage of *windows of opportunity*. Ritter (1991) suggests that there are periods when companies operating in certain industries are mispriced, and this is exploited by non-listed companies in the same industry who decide to go public because it is likely that also their shares are highly valued. This means that the cost for the capital is lower when the shares of the company are overvalued since the same amount of money can be gathered by issuing fewer shares or the number of shares stays the same, but the proceeds of the offering increase due to overvaluation. According to Pagano et al. (1998, p. 41–42), there are two reasons why companies conduct an IPO when their market-to-book (MTB) ratios are high. First, there is a high valuation placed on future growth opportunities, and those opportunities require significant investments that are funded with proceeds from IPO. The second option is that the companies are only getting listed because investors are overoptimistic which of course from an investor's point of view is a very unfavorable situation.

Disadvantages of going public

Even though companies benefit from listing in many ways there are also many disadvantages associated with going public. First of all, the IPO process is very expensive and there are many immediate costs such as registration and underwriting fees but also recurring expenses as auditing costs and stock exchange fees. However, most of these costs are relatively cheaper for larger companies and hence more significant disadvantage for small firms. (Pagano et al., 1998, p. 37–38.)

In addition, there are several indirect costs and some of them might be harmful to the future of the company. IPO underpricing phenomenon is a great example of these kind of costs since shares are sold below their true price and hence there is "money left on the table" by the issuing company. On the other hand, Dunbar (1998, p. 74–75) documents that only under 10% of companies that have experienced an unsuccessful IPO will ever go public in the future. One possible explanation for this phenomenon offered by Dunbar is that after an unsuccessful offering it might be challenging ever to raise equity capital through the listing process. In other words, the future of a company can be determined during the IPO process, and thus indirect costs can in some cases be very significant.

Companies also give away a large part of their privacy after they go public. For example, the rules of stock exchanges require that companies reveal private information about many things such as their current research & development projects or future strategies and this possibly leads to a situation where company loses part of its competitive advantage after the IPO (Pagano et al., 1998, p. 38). Therefore, this may be one of the reasons why some large and successful companies remain private even though they could easily implement the IPO without the risk of an unsuccessful offering.

2.3 Delisting

As described previously in this chapter, publicly listed companies gain multiple benefits compared to their privately-owned counterparts. However, sometimes companies get delisted, and there several possible reasons why this might happen. The decision might be done voluntarily but sometimes there are no other options, for example, in the case of a bankruptcy.

Boot, Gopalan and Thakor (2008, p. 2016) reveal some of the most common motives for a publicly listed company to go private. According to their results, the performance of the company on the stock market has a significant effect. For instance, increases in the stock price decrease the likelihood that the company will go private, whereas increases in the volatility of the price has an opposite effect. Besides, especially younger companies are more willing to go back to private when the level of investor participation decreases, for example, during difficult economic times. Another major reason for the delisting of a public company is some kind of acquisition. For example, Pour and Lasfer (2013) show that takeovers are one of the most typical reasons to go private.

2.4 Initial public offering process and valuation

According to Sherman (2005, p. 617), challenging and expensive evaluating of shares is one of the key characteristics of IPOs. There are several different ways to implement the IPO, and the structure of the issuing process depends on decisions made by the underwriter and the management of the company. There are various practices to price and allocate shares, but the main global IPO methods are book building, fixed price offering, and auction IPO. The fourth model that is examined briefly in this chapter is called a hybrid offering which combines features from the fixed price offering and the book building (Sherman 2000).

The book building mechanism has been traditionally used in the U.S. whereas the fixed price offering has been more popular in most of Europe, in the UK and its prior colonies and with U.S. best-efforts IPOs (Busaba & Chang, 2010). However, studies such as Ritter (2003, p. 426-428) and Sherman (2002, p. 8) show that fixed price offerings have lost their market share in Europe while book building and hybrid offerings have become much more popular than before. This phenomenon also affects the Nordic countries and hence this chapter presents all of these mechanisms.

The Book building method

The typical IPO process has multiple participants such as informed investors, uninformed investors, the issuing company and underwriters and often there are significant information asymmetries between them. It is suggested that all the IPO parties except informed investors are uninformed although the management of the company and underwriters have a vast amount of information about the firm's future. The idea behind this argument is that, even though it can be assumed that the financial situation and the market position of the company are better known by the firm and the underwriter than any single informed investor, the group of informed investors comprises large amount of individuals and hence it is likely that insiders of the offering are actually uninformed compared to that group. For example, individual investors may have crucial inside information about the issuer's main competitor. Secondly, since there is a vast amount of private information given up to the public by the company during the issuing process, the informational advantage of insiders disappears. Information is revealed by the company in two different ways. Directly through the prospectus which reveals plans and activities and indirectly through the price of the IPO since it can be compared to other similar offerings. (Rock 1986, p. 190.)

The study of Booth and Smith (1986) highlights the certification role of underwriters and how it is associated with the asymmetric information. According to their model, investment banks can be used as certifications for IPOs since it reduces the lack of confidence

in issuers. The lack of trust emerges since there is an assumption of asymmetric information between insiders of the issuing company and potential investors. Therefore, it creates an incentive to overprice the offering since it is possible that the future cash flows of the company are overestimated by outsiders. (Booth & Smith, 1986.) The certification role of underwriters is discussed more precisely later in this thesis.

Determination of the offer price is not an easy task since there is a great amount of asymmetric information between participants of the IPO process. One major problem is that collecting information from the investors is often very complicated since it is beneficial to them if the positive information about the company is hidden from the underwriters because it leads to a situation where underpriced shares can be purchased at the offering price and later sold at a higher price. (Benveniste & Spindt, 1989, p. 344.)

The book building model is created by Benveniste and Spindt (1989) and according to their study, underpricing of IPOs is a partly natural phenomenon due to all the information that is acquired from the investors when the company is evaluated. During the first step of the evaluating process, the prospects of the company are examined by the underwriter and based on that information an offer price range is estimated. The next step is the “road show” which starts the two-way interaction between insiders of the IPO and large potential investors such as mutual funds and pension funds. During the road show, the IPO is promoted across the country by the lead underwriter and the senior management of the company. After the IPO has been introduced, it is the potential investor’s turn to reveal their opinions about the offering. (Berk & DeMarzo, 2017, p. 878.)

The information received during the road show is not free of charge since they have to compensate those investors who are revealing positive information about the issuing company which is done by underpricing the offering. However, one of the special features of the book building model is that some of the investors can be favored by allocating a majority of shares to them and hence, cooperative and truthful clients are

rewarded by underwriters by adding them to their list of regulars. The list of regulars consists of investors who are continuously participating in offerings and receiving priority of shares allocated by the underwriter. According to the model, IPO underpricing is reduced by this procedure since investors in the list of regulars can be induced to participate in less attractive offerings. In other words, sometimes regular investors have to buy overpriced issues that they would not be otherwise interested in. It is made possible by the fact that uncooperative investors can be removed from the group of regulars which leads to lost profits. However, it requires that the expected value of future profits is at least as large as the loss which results from participation in poor offerings. (Benveniste & Spindt, 1989.)

Unlike previous book building literature, Sherman (2000, p. 708-709) suggests that allocating priority of shares to regulars may be more important with uninformed investors than with informed investors. Since the offer price is the same for everyone, there are excess returns received by uninformed investors because evaluation costs are paid by informed investors. The book building method is often criticized because it is thought to be “unfair” to small, uninformed investors but according to Sherman, it may be an attempt to make IPO process more efficient via reducing IPO underpricing. It is also reminded by Sherman (2000, p. 698) that the use of the road shows with other methods than book building is not prohibited, but the problem is that acquiring information about the offering becomes significantly more difficult since shares cannot be allocated based on the information received from informed investors.

Fixed price offering

There are two major differences between the book building model and the fixed price offering. First, in the latter model, the offer price of the stock is decided without first collecting information from potential investors. Second, in fixed price offerings shares cannot be freely allocated by underwriters, and thus there is no need for road shows. Therefore, the role of underwriters is significantly smaller than in book-built IPOs and

hence the direct costs of fixed price offerings are often much lower. Unlike in book building, every investor bids the offer price that has been defined by the insiders of the IPO, and therefore informed investors are not directly participating in the evaluating process. (Benveniste & Busaba, 1997.) This leads to a situation where it is possible that some essential information about the issuing company is not incorporated into the final offer price and hence from the viewpoint of capital market efficiency (Fama 1970), the fixed price model is a worse option than book building.

Hybrid offering

A combination of book building and fixed price offering is called a hybrid offering. According to Sherman (2000), the operating principle of this method is based on the idea that there is a fixed price method used for retail investors while the book building model is applied for acquiring information from institutional investors. It can be considered as a fairer mechanism compared to traditional book building since there are no regular groups of individual investors formed by underwriters. However, Sherman argues that hybrid offerings can experience higher levels of underpricing than book-built IPOs since underwriters cannot add uninformed retail investors to the list of regulars.

Auction IPO

The mechanism of auction IPOs differs significantly from traditional methods since the underwriter is not allowed to control price nor allocations (Sherman, 2005, p. 639). Allocation of shares is based on bids made by investors, not on long-term relationships and hence it can be considered as a more transparent and “fair” mechanism compared to book building model. Derrien and Womack (2003, p. 59–60) try to find out what kind of IPO procedure is optimal for controlling underpricing in different market conditions in France. Their results indicate that the initial price of OPM-procedure, which is an auction-like mechanism, includes more information about the current state of the market than the book building model. The explanation offered by the paper of Derrien and

Womack is that since in the book building model underwriters are controlling both price and access to major institutional investors, issuing companies are ready to accept a second-best underpricing outcome.

Regardless of some advantages associated with auction IPOs, it also has downsides since Sherman (2005, p. 632-634) investigates differences between auction and traditional IPOs and reveals that there is more risk associated with auctions than with conventional methods. The risks are taken by investors and the issuer since in the auction IPO the decision about information acquiring is done before it is known whether or not investors will receive shares. For example, it is possible that an individual investor purchases expensive information but ends up receiving zero shares, and this could lead to a situation where potential investors do not participate in the auction since it is uncertain how many shares will be allocated to them. The likelihood of this scenario becomes much higher when the number of potential bidders grows and hence at the same time it increases the risk of an unsuccessful offering.

3 Initial public offering underpricing

Underpricing means that the offer price of an IPO is lower than the aftermarket price at the end of the first trading day. In other words, the issuing company could have sold its shares at a higher price which would have increased the proceeds of the offering. This return achieved during the first trading day is also widely known as the initial return. Underpricing does not only occur in the United States since its existence has been documented by various studies all around the world. For example, Banerjee, Dai and Shrestha (2011, p. 1297) show that between 2000 and 2006 average initial returns in Denmark, Finland, Norway and Sweden were 13,5%, 14,6%, 4,3% and 21,8%, respectively.

Ritter (2020) reports that the average initial return in the U.S. between the years 1980 and 2019 has been approximately 18% and because the aggregate IPO proceeds during this period were 937,19 billion USD, it can be argued that issuers lost 172,08 billion USD because of the IPO underpricing. The study of Loughran and Ritter (2002) calls this as "the money left on the table" since basically it means that those investors who managed to get their portion of shares from the underpriced IPO take the money that issuers leave on the table. They report that between the years 1990 and 1998 the total amount was over 27 billion USD, but despite that issuers rarely complained about the situation. This is considered to be weird by many financial economists since the amount is roughly twice as large as the fees paid to the underwriters. However, one of their explanations for this behavior is that even though the average amount of money left on the table in IPOs (9,1 million) is large, the median amount (2,3 million) is significantly smaller and hence the majority of the money left on the table comes from a small group of IPOs. Another explanation is that pre-IPO shareholders also receive good news since even though the actual offering might have been underpriced the increase in the stock market means that the shares that they still own are actually more valuable than they previously thought and hence they are pleased with the outcome of the offering. (Loughran & Ritter, 2002, p. 414.)

As shown previously, the volume of IPOs varies annually, but this is also the case with the underpricing phenomenon. The level of underpricing has continuously fluctuated during Ritter's sample period, but there are certain years when it has changed more notably. During the IPO phenomenon in the 1990s, initial returns were record-breaking. Especially, the year 1999 was phenomenal since in the top 25 list of the highest first-day gains every company had an initial return of over 200%. For example, an internet company VA Software Corporation had an extreme first-day return of almost 700%. (Ghosh, 2006.) However, the dot-com bubble caused by the enormous popularity of the internet stocks started to melt down in 2000, which caused a significant drop in the annual IPO volume.

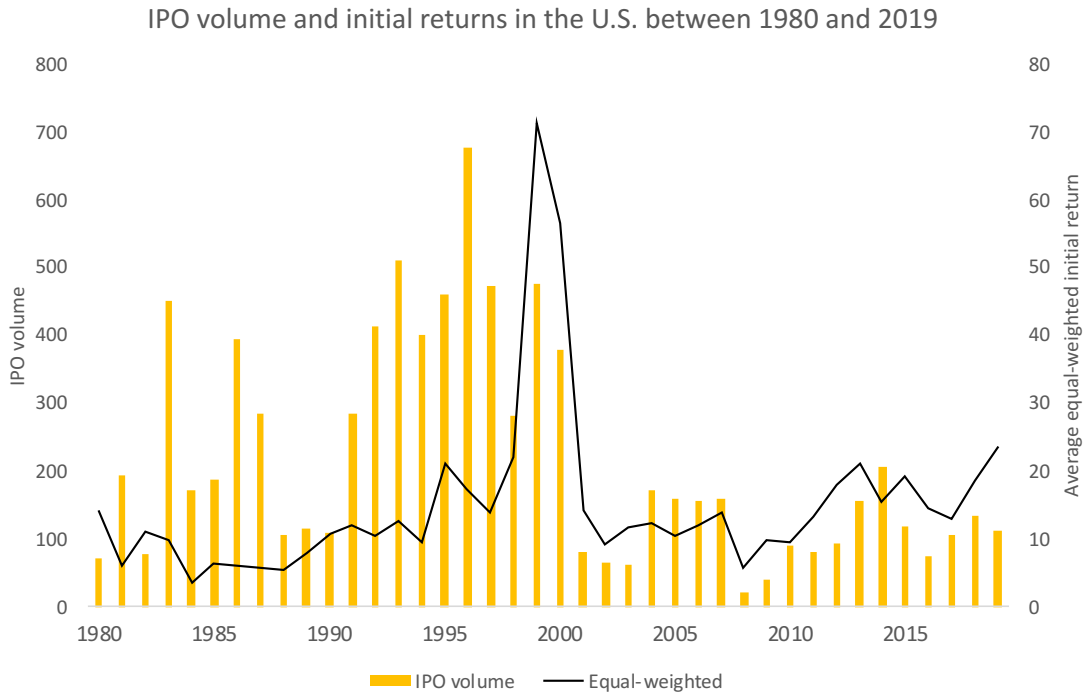

Figure 2. Average equal-weighted initial returns and number of IPOs in the U.S. (Ritter 2020).

3.1 IPO underpricing theories

Ritter and Welch (2002) divide underpricing theories into three categories which are theories based on asymmetric information, theories based on symmetric information, and theories focusing on the allocation of the shares. The model of Ritter and Welch is introduced in this thesis since it offers a clear way to divide underpricing theories into different groups. However, it is good to remember that those three categories presented in this study are just one way to group these theories and therefore alternative models occur in the academic literature.

The first category is theories based on asymmetric information, and according to Loughran and Ritter (2004, p. 7), the majority of models explaining IPO underpricing belong to this category. In such theories, it is assumed that one of the parties in the IPO process is better informed than the others and that there is a positive correlation between the degree of asymmetric information and underpricing (Ritter & Welch, 2002, p. 1803–1807). For instance, it is documented by Michaely and Shaw (1994, p. 315) that if the underwriter quality increases the needed level of underpricing decreases since information asymmetry between informed and uninformed investors is reduced.

Another example of theories based on asymmetric information is given by Derrien (2005) whose paper complements previous IPO studies and discovers that the demand of individual investors is significantly correlated with market conditions that prevail at the time of the IPO. Therefore, during a bullish market sentiment, some investors are willing to buy shares at higher prices than they normally would. Insiders of companies that are going public when *noise traders* are bullish are not disappointed to leave money on the table because they know that their shares are already overpriced at the time of the IPO. The definition of noise trader is created by Black (1986) who argues that on financial markets noise is contrasted with information and thus trades made by some investors are based on noise instead of correct information. According to this model, noise traders lose money since their investment decisions are based on noise but at the

same time, this benefits information traders and makes markets more liquid. In other words, there is an information asymmetry between noise traders and rational investors.

The second category comprises theories based on symmetric information. In contrast to the previous category, these theories assume that the underpricing of IPOs is not caused by information asymmetries between the parties involved in the offering, but there are some other reasons behind this phenomenon (Ritter & Welch 2002, p. 1807). For example, it is suggested by Tiniç (1988) and Hughes and Thakor (1992) that IPOs are underpriced since it minimizes the risk of lawsuits and also protects the reputation of the firm and the underwriter. However, some studies are contrary to these legal liability theories. For example, Keloharju (1993) examines 80 IPOs that were issued in Finland between 1980 and 1989 and finds out that the average initial return for the sample is 8,7%. The study argues that the lawsuit-avoidance hypothesis is not very likely to offer a full answer to why IPOs are underpriced because the law in Finland differs significantly from the law in the United States and it is not very likely that IPO companies would be sued by disappointed investors in Finland. Therefore, Keloharju suggests that there are other reasons behind the underpricing phenomenon such as asymmetric information between investors.

The lawsuit-avoidance hypothesis offers one possible explanation for why IPOs were so extremely underpriced during the dot-com bubble. Since the offer prices were already so high, it is possible that liability concerns prevented underwriters from increasing the price of internet companies. In other words, this theory suggests that underwriters did not take full advantage of the temporarily overoptimistic investor sentiment in the market. However, this hypothesis is not supported by the fact that during the dot-com bubble valuations of the already highly valued companies were increased via other methods by underwriters. For example, there were “buy” recommendations given by investment banks even though the prices were already very high. (Ritter & Welch, 2002, p. 1807–1808).

The third category includes theories focusing on the allocation of shares. As mentioned before, book building model enables that shares of an IPO are freely allocated by underwriters. In addition to this, book-built IPOs often include an overallotment-option that can be used for distributing more shares to investors. According to Ritter and Welch (2002, p. 1808), allocation of shares is more and more studied since it has received increased public attention and nowadays it is much easier to gather data about trading activities. Despite this, there are still some difficulties in finding sufficient data since the information varies between sample periods and it is often guarded by underwriters.

3.2 The role of underwriters in IPO underpricing

Number of lead underwriters

The paper of Vithanage et al. (2016) examines how the performance of IPOs is affected by the number of lead underwriters involved in the offering process. Their sample consists of 1555 US companies that went public between 1999 and 2012 and they introduce two different hypotheses which are certification hypothesis and market power hypothesis.

To understand better the certification hypothesis, it is important to know about the previous studies about this topic. For example, as mentioned earlier, it is documented by Booth and Smith (1986) that underwriters have an important certification role in the IPO process. The reason for this is that typically there are significant information asymmetries between insiders of the issuing company and potential investors which can lead to trust issues and deviations from the real value. A study of Corwin and Schultz (2005) shows that larger syndicates are more capable to produce additional information about the target since they have more resources and broader networks with investors. Their paper also states that underwriters in the syndicate want to protect their reputation and

since mispriced IPOs can significantly harm the reputation, it gives them a strong incentive to ensure that offerings are priced as close to their intrinsic value as possible.

Therefore, based on these above-mentioned studies the certification hypothesis of Vithanage et al. (2016, p. 194) assumes that MLU IPOs should be priced more accurately and thus these kinds of offerings should have lower and less volatile first-day returns. Their explanation for this is that syndicates with more than one lead underwriter should give extra certification to the offering since they have more information, better connections, they all are interested in to protect their reputation which hence leads to a more accurate offer price.

On the other hand, the market power hypothesis introduced by Chemmanur and Krishnan (2012) argues that IPOs with more than one lead underwriter should have higher and more volatile first-day returns. The idea behind this is that MLU IPOs are more likely to have so-called "high-quality market participants" such as star analysts, venture capitalists and institutional investors associated with them (Bajo, Chemmanur, Simonyan, and Tehranian, 2016). Their involvement could potentially raise the expectations of less-informed retail investors and increase the aftermarket stock price during the first trading day and hence lead to more significant initial returns for MLU IPOs (Vithanage et al., 2016, p. 195).

The results of the Vithanage et al. (2016) give strong support to the certification hypothesis since they report that in the U.S. MLU IPOs have lower initial returns and lower variability of initial returns than their SLU counterparts and hence it seems that MLU syndicates make IPO pricing process more efficient and accurate. However, the paper also reveals that the relationship between the number of lead underwriters and underpricing is not linear since it is shaped like a letter "U". In other words, extra lead underwriters first make the pricing process more efficient by decreasing the level of underpricing but after a certain point the effect is reversed, and additional underwriters actually start to again increase it. The finding is in line with the study of Pichler and Wilhem

(2001) that points out that larger syndicates often face a moral hazard problem where underwriters have an incentive to free-ride on one another during the information production phase. Therefore, it means that when the syndicate exceeds its optimal size, it makes the whole process less efficient and weakens the certification role of the lead underwriters. (Vithanage et al., 2016.)

Underwriter reputation

The Carter-Manaster (CM) system is a reputation measure that ranks underwriters on a scale from zero to nine. Underwriters rated as nine are considered to be the most prestigious, for example, banks such as Goldman Sachs and Merril Lynch, and correspondingly the least prestigious underwriters are those who are rated as a zero. The model uses tombstone announcements which are listings of pending public security offerings, to find out the hierarchy between underwriters. (Carter & Manaster, 1990.)

There are many reasons why large stable companies are marketed by the highest ranked underwriters. First of all, IPO underpricing is expensive and harmful to the issuer and therefore prestigious underwriters are chosen by less risky companies as an attempt to reveal the low-risk characteristics to the possible investors. At the same time, prestigious underwriters avoid riskier companies since involvement in that kind of offerings can harm their reputation. Hiring a prestigious underwriter leads to a situation where higher fees are charged from the issuing company but since underpricing is significantly reduced it is still the most cost-effective option. However, high-risk firms are not able to falsely signal their quality to investors by using highly ranked underwriter since the risk level of the company is identified by underwriters. In other words, the fee charged by the underwriter is increased, and the IPO process becomes even more expensive than it would have been with a low reputation underwriter. (Carter & Manaster, 1990.)

Carter, Dark and Singh (1998) investigate how initial returns and the long-run performance of IPOs are affected by the underwriter reputation with a data sample covering

2292 IPOs in the U.S. between 1979 and 1991. In the study, there are three alternative reputation proxies used, and one of them is the previously mentioned Carter-Manaster system. This time investment banks are divided into three groups based on their CM ranks. Those groups are low, medium and high and the lowest category includes underwriters that are ranked between 0 and 5, the middle one includes ranks 6 and 7, and the last group consists of the most prestigious underwriters that are ranked as 8 or 9. In their sample, the average CM rank is 6,97 and the median is 8,00. Their findings are consistent with previous studies since they find out that larger and more stable companies are associated with more reputable underwriters. These companies are also safer investments than younger and unestablished firms, and hence the initial returns are lower for IPOs brought to market by prestigious underwriters. The explanation to this phenomenon offered by Ritter (1991) is that investors are over-optimistic about young IPOs, and thus prices of some stocks rise significantly in aftermarket

4 IPO long-term performance

The purpose of this chapter is to briefly provide a general understanding of the long-term performance of IPOs but also highlight previous studies that have found out that underwriters truly can have an impact on it. Therefore, this chapter is divided into two subchapters where the first one discusses the overall long-term performance and the most common ways to measure it while the second one concentrates on the role of underwriters.

4.1 Overview of the long-term performance

The poor long-run performance of initial public offerings is documented in numerous studies by several researchers. The performance of IPOs is often calculated with market-adjusted returns or a wealth relative ratio which is defined as the ratio of the end-of-period wealth from holding an IPO portfolio to the end-of-period wealth from holding a portfolio of matching non-IPO firms (Loughran & Ritter, 1995, p. 28). One of the first and most well-known studies on this subject is "*The Long-Run Performance of Initial Public Offerings"* by Ritter (1991) which uses a sample that consists of 1526 IPOs that have been implemented in the U.S. between years 1975 and 1984. In this paper, the long-term raw return is calculated using the following 36 months after the first trading day and hence it excludes the initial return. After that, Ritter compares them to the returns of matching companies which are chosen in a way that the industry and the market capitalization of the companies would be approximately the same.

The results of the Ritter's empirical analysis indicate that even though the weak long-term performance is not so regularly occurring phenomenon as the underpricing, the strategy of buying IPOs after the first day of public trading and then holding those shares for the next three years yields significantly less than investing in a group of matching non-IPO firms with the same holding period. The mean wealth relative ratio of the

sample is only 0,831 which means that on average an equally weighted IPO-portfolio has 17% lower returns than its benchmark portfolio which consists of matching non-IPO companies.

Ritter (1991) offers three possible explanations for this phenomenon which are *risk mis-measurement*, *bad luck* and *fads and overoptimism* and the evidence provided by his study supports the theory that the market prices of IPOs are affected by fads and over-optimism. The general idea behind this explanation is that there are times when investors are irrational and too optimistic about the future performance of certain industries. The results are consistent with this explanation since the long-term underperformance is more common with younger companies and becomes stronger during periods when many companies are going public. (Ritter, 1991, p. 4.) The dot-com bubble is a great example of bullish investor sentiment since as documented by Ghosh (2006) at the turn of the millennium, both the volume and initial returns of internet IPOs were extremely high. If the return of the first trading day is high because of overoptimistic investors, the probability that long-term buy-and-hold IPO strategy underperforms a strategy investing in matching non-IPO companies increases since calculations exclude the initial return.

Figure 3 provides more recent evidence about the poor long-term performance. Market-adjusted returns are calculated as the buy-and-hold return on IPO minus the compounded daily return on the CRSP value-weighted index of Amex, Nasdaq and NYSE firms. It comprises U.S. IPOs from 1980 to 2018 and it reveals that even though raw returns have been generally positive, IPOs tend to have negative BHARs when they are compared against their benchmarks. (Ritter, 2020.)

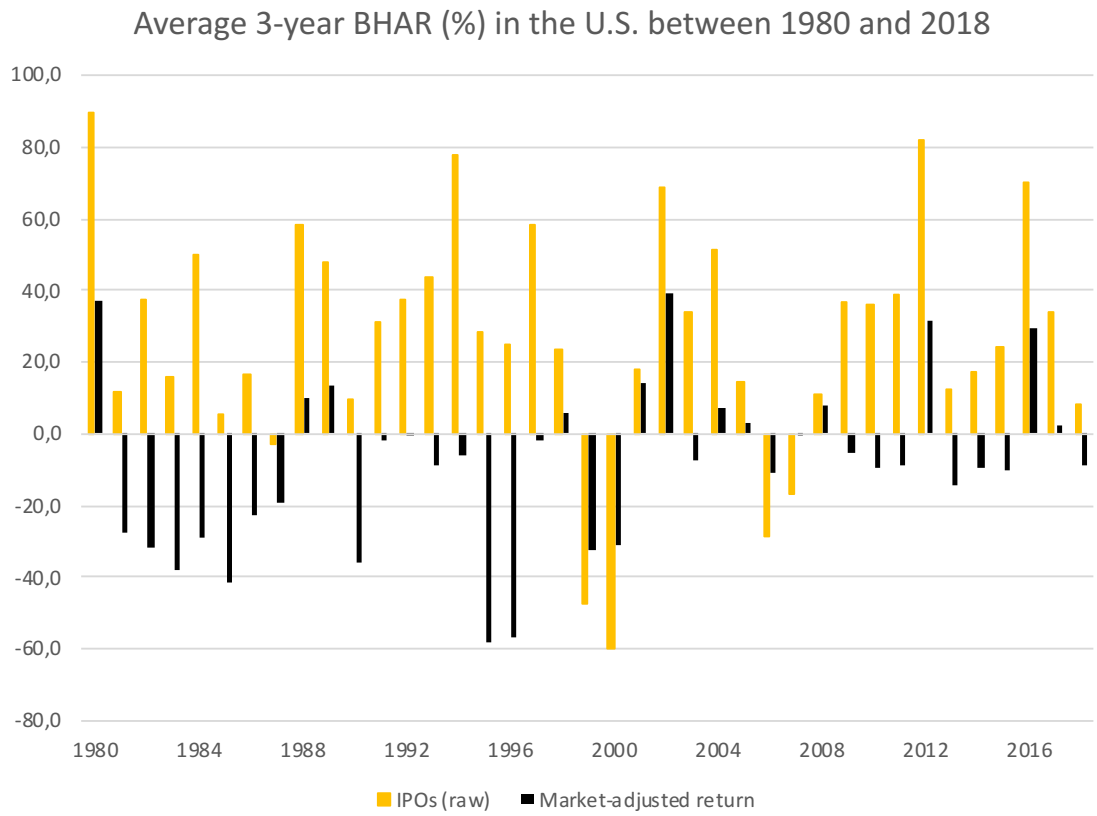

Figure 3. Average 36-month BHAR in the U.S. between 1980 and 2018 (Ritter, 2020).

4.2 The impact of underwriters on long-term performance of IPOs

Number of lead underwriters

As mentioned earlier in chapter three, the study of Vithanage et al. (2016) has two hypotheses, market power hypothesis and certification hypothesis which are in contrast with each other. The certification hypothesis assumes that offerings backed up by multiple lead underwriters have less information asymmetry between different participants and have better long-term performance than those IPOs which have only one lead underwriter managing the IPO process. The alternative option is the market power hypothesis which assumes that MLU syndicates take an advantage of their higher market power and overvalue their offerings to maximize their fees which would increase initial returns but also make these companies worse long-term investments since the valuation

difference between more optimistic and pessimistic investors would eventually disappear and. (Vithanage et al., 2016, p. 195.)

The results of Vithanage et al. (2016) strongly support the certification role of MLUs since they report that in the U.S. IPOs with multiple lead underwriters are typically associated with better long-term performance. However, they note that similar to the relationship between underpricing and syndicate size, also the relationship between long-term performance and the number of lead underwriters is non-linear, but this time it is shaped like an inverted "U". In practice, this means that first additional underwriters tend to improve the long-term performance but after a certain point they start to harm it. (Vithanage et al., 2016.)

The finding that the long-term performance of IPOs is affected by the size of the lead underwriter syndicate also supports the results of the study of Dong, Michel and Pandes (2011) whose paper examines the relationship between the long-term performance and underwriter quality which they measure by the number of managing underwriters, underwriter reputation and the absolute price adjustment during the IPOs pricing process. Their empirical analysis reveals that IPOs backed up by larger syndicates achieve higher returns than the ones with fewer underwriters.

Underwriter reputation

Ritter (1991) documents that the poor long-term performance phenomenon is particularly true for young companies and some of the possible explanations for it are overoptimism and fads but it is also reported by Carter et al. (1990) that younger companies are more often marketed by non-prestigious underwriters, and hence it raises a question about the possible impact of underwriter reputation on the IPO long-term performance. Michaely and Shaw (1994) analyse this relationship and the results of their study reveal that there is a significant difference in long-term returns between the IPOs issued by prestigious and non-prestigious investment banks.

The same phenomenon has also been examined by Carter, Dark and Singh (1998) and their results are consistent with the study of Michaely and Shaw (1994) since they find out that three-year market adjusted returns of IPOs managed by prestigious investment banks are higher than returns of their benchmarks. The difference is significant since the empirical analysis reveals that the wealth relative ratio between high reputation and low reputation offerings is 1,32. According to Carter et al. (1998, p. 286), there is no widely accepted explanation for this phenomenon in academic literature, but for example, Chemmanur and Fulghieri (1994, p. 58) suggest that prestigious investment banks try to market high-quality IPOs since it protects their reputation. In other words, it seems that the reputation of the underwriter does not directly affect the three-year market-adjusted return of the IPO, but quality companies are often marketed by high reputation underwriters since low-quality offerings could hurt their reputation which is very valuable for them.

A more recent study about this topic has been done by Dong et al. (2011, p. 248), and also their results give support to the positive relationship between underwriter reputation and long-term performance since they point out that offerings with prestigious underwriters have 24% higher equal-weighted 36-month abnormal returns compared to the offerings that are managed by less reputable underwriters.

The figure below demonstrates differences in average long-run market-adjusted returns between IPOs marketed by low and high reputation underwriters in 2292 IPOs that were issued between the years 1979 and 1991. Firms are divided into two different groups based on the Carter-Manaster reputation system where the median rank is eight, and hence underwriters ranked below the median are considered to be low reputation underwriters whereas underwriters ranked at or above eight are considered to be prestigious. (Carter et al. 1998.)

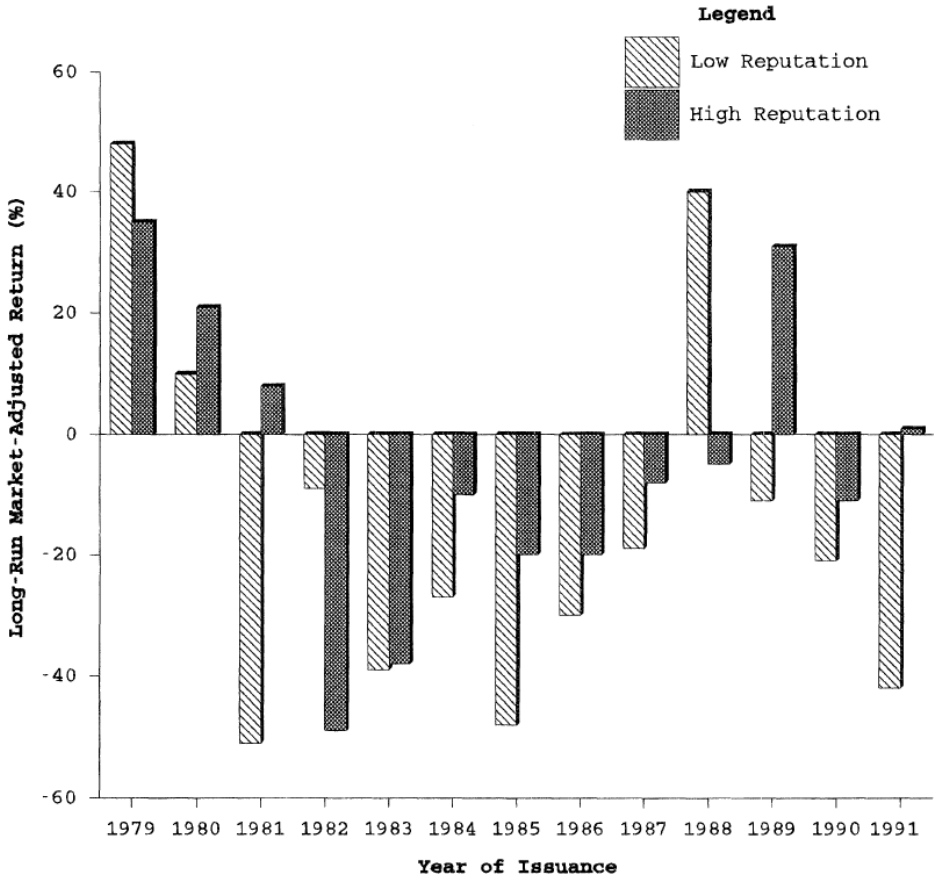

Figure 4. The reputation of underwriters and long-run market-adjusted returns (Carter et al. 1998).

Underwriter networks

Bajo, Chemmanur, Simonyan, and Tehranian (2016) examine how the lead underwriter's position in the network of investment banks has an impact on several IPO characteristics and one of them is the long-term performance of IPOs. The sample of the study consists of 6217 IPOs issued between years 1980 and 2009, and the role of the specific underwriter in the network is determined by various centrality measures, such as *degree* which counts the total number of connections that the underwriter has, or *2-StepReach* which measures how many direct and indirect connections the underwriter has. Indirect connections are other underwriters who are connected with the underwriter's connection but not with the underwriter itself, and therefore they are considered to belong to the same network.

The results of (Bajo et al. 2016, p. 401–402) reveal that the underwriter centrality boosts market-adjusted returns of IPOs which is probably caused by the increased investor attention. However, it seems that returns are affected by the underwriter's centrality for only a year, and after that, the effect disappears. Despite this, it seems that the choice of a well-networked underwriter benefits the issuing company by increasing the performance of its shares for a relatively long time and hence should make this kind of underwriters more desired among companies that are planning to go public.

5 Data and methodology

This section describes the data and methodology that it is used in the empirical part of this study. The data is collected from two main sources. The first one is SDC Platinum by Thomson Reuters and the second one is Datastream. In addition, this paper also uses Orbis and prospectuses and websites of companies that have conducted an IPO to complete some of the missing information.

SDC Platinum is a widely used source for information about IPO companies and hence it is also used as the main data source in this study. It offers us a large amount of crucial information such as the offer price of the IPO, underwriters involved in the offering and the issue date. However, it does not provide all sufficient information about the historical prices of these companies and hence this study uses stock price information collected from Datastream to calculate initial returns, return volatility and the long-term performance of Nordic IPOs.

5.1 Data

The data consists of Danish, Finnish, Norwegian and Swedish IPOs between the years 1999 and 2015 that are listed on their main stock exchanges. These exchanges are Nasdaq Copenhagen, Nasdaq Helsinki, Nasdaq Stockholm and Oslo Stock Exchange which is the only one that is not part of Nasdaq Nordic and hence fully independent. The reason why the dataset excludes the Iceland Stock Exchange (IXEC), although Iceland is one of the Nordic countries, is that it is very small and inactive compared to the other four exchanges which makes it challenging to compare with the rest of countries.

The total amount of companies in this study is 291 and the distribution between different countries is the following; Denmark 39 (13%), Finland 46 (16%), Sweden 101 (35%) and Norway 105 (36%). This paper excludes some of the companies that went public

during this period due to various problems in the data quality. The most common reason was that the original offer price during the IPO was not found which makes it impossible to calculate the initial return which is one of the main targets of this study. Another common problem was that the company did not have a reliable stock price history. In these cases, the IPO is still included in the initial return analysis if this variable can be found directly from the SDC Platinum database. As a consequence of this, the sample sizes used in the long-term performance analyses are smaller than the ones used with first day returns. However, the number of companies that do not have historical stock prices available is only eight, and hence the differences in the sample sizes are not significant.

Following prior studies such as Levis (2011, p. 258), this paper also excludes all real estate investment trusts (REITs) and relistings from the data. For example, the sample only includes the first initial public offering of Suomen Terveystalo Oyj in 2007 even though the company got delisted and eventually got relisted ten years later in 2017. The exclusion of REITs is an established practice among IPO studies since there are studies such as Wang, Chan and Gau (1992) and more recently Chan, Chen and Wang (2013) which show that the aftermarket performance of REIT IPOs has some unique features and thus these companies could distort the main results. The number of REITs among Nordic IPOs during the observation period is not very high since in total there are only eight of them in the dataset which are distributed between the countries as the following; Finland 2, Denmark 4, Norway 3 and only 1 in Sweden.

The main drawback with the data is that especially the older IPOs are often missing many important variables. For instance, the data includes 17 observations that do not have any underwriter information and hence this paper excludes these companies from the regressions that are trying to find out the connection between the number of lead underwriters and IPO performance. Besides, many of the firms are lacking other useful information such as market capitalization at the time of the offering, profitability figures and the gross spread that is paid to the underwriters. Therefore, it is clear that the

varying data quality causes some difficulties in the analyses which will be discussed in more detail later.

As mentioned in the second chapter, sometimes public companies get delisted and, in some cases, it can happen fairly soon after the IPO. This study does not specify the reason why each company got delisted in such a short time even though it would be a great research topic for the future. The reason behind this decision is that it would take a lot of time to analyse these motives, but it would not offer much additional value to these analyses. The data of this study consists of 36 (Norway 19, Sweden 9, Denmark 4 and Finland 4) companies that got unlisted before their 3-year anniversary. It is established practice in IPO studies that also the return of these companies is taken into account in the analysis since as stated by Ritter (1991, p. 12), these issues frequently perform worse than other companies and hence excluding them could cause survivorship bias in the sample. In practice, this means that the buy-and-hold abnormal return is calculated using the truncated return interval, for example 28 months, for both the company and the benchmark index.

The main inspiration for this paper is the study of Vithanage et al. (2016) where the sample includes IPOs from the U.S. between 1999 and 2012. According to their study, the IPOs with multiple lead underwriters were virtually non-existent before 1999, and hence also this study uses it as the starting year which also increases the comparability of these results. The last year of the sample is 2015 since this study calculates the buy-and-hold abnormal return (BHAR) by comparing returns of IPOs to their benchmark-indices during a 36-month estimation period. Because we could use only a part of the IPOs implemented in 2016, this paper decides to exclude every offering that takes place after 2015.

The following table demonstrates the yearly composition of the lead underwriter syndicate structure in Nordic IPOs between the years 1999 and 2015. The percentage calculations use column “N” as a total amount which excludes IPOs with unknown lead

underwriters. The table shows that the trend is in line with the findings of Vithanage et al. (2016) since the proportion of SLUs has been significantly decreasing during this observation period.

Table 1. Nordic IPOs and size of the lead underwriter syndicate.

			Lead underwriters		Number of lead underwriters				
Year	N	Unknown	Mean	Median	1	2	3	4	≥5
1999	27	9	1,4	1,0	67 %	22 %	11 %	0 %	0 %
2000	39	0	1,4	1,0	67 %	28 %	5 %	0 %	0 %
2001	13	0	1,5	1,0	62 %	31 %	8 %	0 %	0 %
2002	5	0	1,8	2,0	40 %	40 %	20 %	0 %	0 %
2003	2	0	1,5	1,5	50 %	50 %	0 %	0 %	0 %
2004	11	0	1,8	2,0	27 %	64 %	9 %	0 %	0 %
2005	32	0	2,0	2,0	25 %	59 %	6 %	6 %	3 %
2006	31	3	1,5	1,0	55 %	42 %	3 %	0 %	0 %
2007	26	1	1,4	1,0	65 %	27 %	8 %	0 %	0 %
2008	2	1	1,0	1,0	100 %	0 %	0 %	0 %	0 %
2009	3	0	2,3	3,0	33 %	0 %	67 %	0 %	0 %
2010	14	0	2,9	2,5	21 %	29 %	14 %	14 %	21 %
2011	7	3	2,6	2,0	29 %	29 %	29 %	0 %	14 %
2012	2	0	2,5	2,5	0 %	50 %	50 %	0 %	0 %
2013	9	0	2,6	2,0	22 %	33 %	33 %	0 %	11 %
2014	24	0	2,4	2,0	17 %	46 %	21 %	13 %	4 %
2015	27	0	2,5	2,0	22 %	30 %	26 %	19 %	4 %

IPOs	Denmark	Finland	Norway	Sweden	All
SLU	20	29	25	46	120
MLU	15	8	80	51	154
Unknown	4	9	-	4	17
Total	**39**	**46**	**105**	**101**	**291**

It is also noteworthy that during the more recent years, IPOs with more than two lead underwriters have become much more common than before. For example, before 2010 there was only one year when there was an IPO with at least four lead underwriters. However, after 2010 the situation clearly changed since 2012 was the only year when none of the firms that went public had more than three lead underwriters. Therefore, it seems that MLUs have not only become more popular, but they also involve more underwriters.

There are also notable differences in the syndicate structure between the countries. In Norway, MLUs are very common since approximately three-quarters of the IPOs have

more than one lead underwriter while in Finland this has been relatively uncommon since only 17% of companies going public have multiple lead underwriters involved in their listing process. In Sweden, the distribution is very even between SLUs and MLUs while in Denmark SLUs are slightly more common than the ones with multiple lead underwriters.

Firm characteristics

Table 2 demonstrates certain characteristics of the IPOs included in the sample of this study and whether or not they differ between SLU and MLU IPOs. It is noteworthy that the column "All IPOs" includes also those offerings where the underwriter is unknown and hence the sums of SLU and MLU observations can differ from these values. The equality of means is tested using Welch's t-test, while the equality of medians is analysed by using Mood's median test. Asterisks *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

The first one of these characteristics is the age of the company during the offering and the table shows that in both sub-groups the median age seems to be 10 years, but mean values reveal that a company that is working with multiple underwriters is on average 22,2 years old while the corresponding figure for an SLU IPO is only 16,7 years. Even though this difference is hardly statistically significant at the 10% level it is in line with the findings of Vithanage et al. (2016, p. 198) where they document that in the U.S. syndicates with several lead underwriters are more common among older companies.

Table 2. Characteristics of Nordic IPOs.

	All IPOs			**SLU-IPOs**				**MLU-IPOs**			
Characteristics:	N	Mean	Median	N	Mean	Median	SD	N	Mean	Median	SD
Age (years)	285	19,4	10,0	117	**16,7**	10,0	22,6	151	**22,2** *	10,0	30,5
Underwriter reputation	274	8,7	9,5	120	**8,4**	9,5	2,2	154	**9,0** **	9,4	1,3
VC-backed dummy	276	0,10	0,00	116	**0,1**	**0,0**	0,2	143	**0,2** ***	**0,0** ***	0,4
Gross proceeds (USDm)	291	212,6	72,6	120	**65,7**	**42,4**	71,1	154	**348,6** ***	**157,7** ***	807,8

Another finding of these univariate tests is that also the mean reputation of the underwriters involved in the offering varies between SLUs and MLUs. This reputation metric is introduced in more detail later in this chapter, but the main idea is that larger number means a more reputable underwriter. The table shows that the average rank for SLUs is 8,4 while for MLUs it is 9,0 and this difference is statistically significant at the 5% level with a p-value of 0,011 and hence it supports the findings of Vithanage et al. (2016, p. 198) that MLU IPOs are often associated with highly reputed underwriters.

The third characteristic is whether or not the company that went public was backed up by venture capitalists, which is measured by a dummy variable. Because the differences between SLUs and MLUs are statistically significant at the 1% level, the results strongly indicate, that the probability that there are venture capitalists involved in the offering increases when the offering is managed by multiple lead underwriters. As before, this result is consistent with the study of Vithanage et al (2016, p. 198). The final firm characteristic is the size of the offering measured as total gross proceeds including the overallotment option in millions of US dollars. The table reveals that there are very substantial differences between these two sub-groups since MLU IPOs tend to be much larger. These results are statistically significant at the 1% level and once again support the findings of Vithanage et al. (2016, p. 198).

Stock indices

This study uses various benchmark indices to calculate the BHARs of these companies. Some of them are so-called price indices (PI) which means that cash dividends are not reinvested in the index and hence it only shows the changes in the stock price movements. However, since the return of the investment to the investor can also consist of dividends and not only capital gains, this study also uses total return indices (RI) which give us a more appropriate view about the total returns. Therefore, both PI and RI stock price history information are obtained from Datastream and compared against corresponding benchmark indices.

The most important index is MSCI Europe which includes large and mid-cap companies from 15 developed markets countries in Europe. It covers a significant amount of the free float-adjusted market capitalization in the European Developed Markets equity world. The advantage of MSCI Europe is that since it is not country-specific it is possible to benchmark IPOs from all four countries against it. It was launched in 1969 and has both price index and total return index versions and thus it can be used for even the oldest IPOs in the sample in every analysis. (MSCI, 2020.) This paper uses both PI and RI versions of this index to find out how significant is the impact of dividends on BHARs.

Another benchmark index that can be used against IPOs from every country in this paper is the OMX Nordic 40 PI (OMXN40) which includes the 40 largest and most traded companies on the Nordic stock exchanges. However, the index was created on 28.12.2001 and therefore it does not cover the first three years of the estimation period. This is a major drawback since because of the dot-com bubble there were numerous companies that went public during these years. Another problem is that it is only offered in price index version and hence it does not take into account possible dividends paid by these companies.

In addition, this study also uses country-specific indices to find out how these IPOs perform compared to their domestic benchmarks. However, the main focus is still on MSCI Europe since when companies from each country are compared against the same benchmark it highlights the true differences between the performance of Nordic IPOs. These country-specific benchmarks used in the empirical part are the following; OMX Helsinki 25 PI (OMXH25), OMX Helsinki RI (OMXH), OMX Stockholm 30 PI & RI (OMXS30), OMX Copenhagen 20 (OMXC20), OMX Copenhagen Cap Index RI and Oslo OBX PI & RI (OBX).

5.2 Methodology

Measuring initial return

This study uses the equal-weighted initial return. In other words, it does not take into account the size of the offering in the calculations. However, regression models include the logarithm of the IPO gross proceeds as an independent variable and hence examine what is the effect of the offer size on the first day returns of Nordic public companies.

The formula of the initial return is the following. (Vithanage et al., 2016.)

$$Initial\ return = \frac{First\ day\ \ close\ price - Offer\ price}{Offer\ price} \quad (1)$$

Measuring long-term performance

This study uses buy-and-hold abnormal return (BHAR) to measure the long-term performance of companies that have gone public in Nordic countries between 1999 and 2015.

The formula of BHAR is the following. (Vithanage et al., 2016).

$$BHAR_{i,t} = \prod_{t=1}^{T}\left(1 + r_{i,t}\right) - \prod_{t=1}^{T}(1 + r_{m,t}) \quad (2)$$

where: $r_{i,t}$ = monthly return of an IPO company

$r_{m,t}$ = monthly return of the benchmark index

This formula is used to calculate BHAR for four different time periods which are 36 months, 24 months, 12 months and 6 months. Each month consists of 21 trading-days and thus the total amount of trading-days during a 36-month period is 756 (Ritter, 1991, p. 7). As mentioned before, the return of the first trading day is excluded from these

calculations, and for those firms that are delisted before their 3-year anniversary the calculation period is truncated to the delisting date.

This study mainly focuses on the 36 months BHAR since this 3-year estimation period is commonly used in previous studies. However, these other periods can offer useful information about how returns fluctuate over time and thus are included in the analyses to broaden our understanding of the long-term performance of Nordic IPOs.

Measuring return volatility

The volatility of the returns of IPO companies is measured by calculating the standard deviation of daily returns during the first trading-month. Once again, these months are not calendar months since they are calculated using 21 first trading-days as a publicly listed company. (Vithanage et al., 2016, p. 196.)

Measuring lead underwriter reputation

Underwriter reputation is a frequently used independent variable in previous papers that analyse the aftermarket performance of initial public offerings. Studies that concentrate on the U.S. market can nowadays use underwriter reputation rankings found from the homepage of Ritter (2020) whereas those who examine IPOs in the UK, France, Germany or Italy can use the information collected by Migliorati and Vismara (2014).

However, there are no similar rankings available for underwriters here in Nordic countries and thus this study creates a proxy of lead underwriter reputation, which is quite similar to the ones used by Megginson and Weiss (1991, p. 890) and Banerjee et al. (2011). For example, the latter study measures lead underwriter reputation by comparing their market shares in dollars to the total amount of IPO gross proceeds during their observation period. If there happen to be more than one lead underwriters involved in the IPO process, proceeds are evenly split to each one of them.

In this study, the calculation of lead underwriter reputation is divided into three parts which are now described. The first phase is to calculate the value-based market share of each underwriter by adding up together gross proceeds of all offerings they have been involved in. Following the methodology of Banerjee et al. (2011) in IPOs with multiple lead underwriters, gross proceeds are split evenly between each participant. After these calculations, underwriters are ranked based on their aggregated proceeds. The ones belonging to the highest decile receive value 10, the second-highest decile gets value 9 and so on which means that underwriters with least gross proceeds get rank 1.

The calculation process of the second part is otherwise identical to the first one but instead of gross proceeds, the comparison focuses on the number of offerings. This proxy has been previously used by Lee (2011, p. 4) who states that the number of IPOs brought to the market by the underwriter reflects their reputation effectively and therefore the most reputable underwriters are the ones who have operated as the lead underwriter most frequently. Since there are multiple underwriters with only IPO during the observation period and hence their rank varies between 5 and 1. This would lead into unfair results and to avoid this problem, this study takes average of these ranks (3) and uses it for each of these companies in this category.

The final step of this process is to calculate the average of those two ranks which gives us an approximation about the reputation of each underwriter. The main idea behind this model is to take into account the possibility that there might be different types of underwriters since while others might only involve in large offerings other ones might participate in multiple smaller IPOs and since both types of underwriters can be highly reputed, it is reasonable to analyse both of these factors. The list that contains all underwriters and their ranks can be found in the appendix section of this paper.

Regression analyses

Following the methodology of Vithanage et al. (2016) all regression models use White heteroskedasticity-consistent standard errors which makes the models more robust since without it the possible presence of heteroskedasticity would lead to unbiased but inefficient parameter estimates and inconsistent covariance matrix estimates. In other words, the interpretation of the statistical significance can give faulty results. (Huber, 1967**;** White, 1980.)

The actual regressions are performed later in this study, but this chapter describes them and also the most important independent variables and why they are used. All of these models are quite similar to each other and they have almost the same variables which is caused by two different things. First of all, this study uses variables such as the size of the offering and age which are both very common and often useful independent variables, and thus it is only logical that all models include them. Secondly, as mentioned before, there is a very limited amount of data available about Nordic IPOs compared to the ones that took place in the U.S. As an example, SDC Platinum does not have proper information about the leverage or the total asset size of these companies, even though both of them are commonly used as independent variables in other studies that are related to IPOs. However, since it is possible to use a dollar amounted offer size as a proxy of the company size the lack of the total assets is not a major drawback.

Explanation of variables used in regression models

MLU dummy = A dummy variable that takes value 1 if there are more than one lead underwriters, otherwise it is 0.

Number of lead underwriters = Alternative to the MLU dummy, takes into account the actual number of underwriters.

Dot-com bubble = A dummy variable that takes value 1 if the company went public between 1999 and 2000, otherwise it is 0.

Technology = A dummy variable that takes value 1 if the company is operating on technology industry, otherwise it is 0. Information about the industry is collected from SDC Platinum.

Return 90 days before = Return 90 days prior to the IPO trading date which is calculated using country-specific indices.

Underwriter reputation = Average reputation of all lead underwriters involved in the IPO.

Log (age + 1) = Age is the number of years between the company founding date and the year of the IPO. This study follows the method of Carter et al. (1998, p. 292) and uses the logarithm of one plus age of the company.

VC-backed dummy = A dummy variable that takes value 1 if the IPO is backed by a venture capitalist, otherwise it is 0.

Log (gross proceeds) = Logarithm of the total IPO proceeds, is used as a proxy for the firm size.

Country dummies = Three dummy variables that control for country-specific effects. The fourth country is included in the intercept.

6 Analysis of the short-term performance

This chapter presents the short-term performance-related results revealed by the empirical analysis and whether these findings support the first hypothesis of this paper which suggests that MLUs have less underpricing than SLUs. Furthermore, these results are compared to the ones reported in previous studies to find out if the short-term performance of Nordic IPOs and especially the impact of multiple lead underwriters differ significantly from their counterparts in the United States which is important since there are not so many studies that examine these phenomena in Nordic countries. Even more noteworthy is that according to my knowledge, this is the first study that takes into account the number of lead underwriters in these countries. The main focus of this chapter is on initial returns, but the latter part also includes some analyses that examine the return volatility during the first twenty-one trading days.

6.1 Initial return

The examination of initial returns is divided into two chapters. The first one includes univariate analyses and provides an overview of the IPO underpricing in Nordic countries while the second one consists of regression analyses that aim to find out the actual factors behind this phenomenon.

6.1.1 Univariate analyses

The purpose of this chapter is to present the empirical findings of IPO underpricing in Nordic countries. Therefore, figure 5 offers an overview of this topic by illustrating the development of IPO volumes and both average and median initial returns between 1999 and 2015.

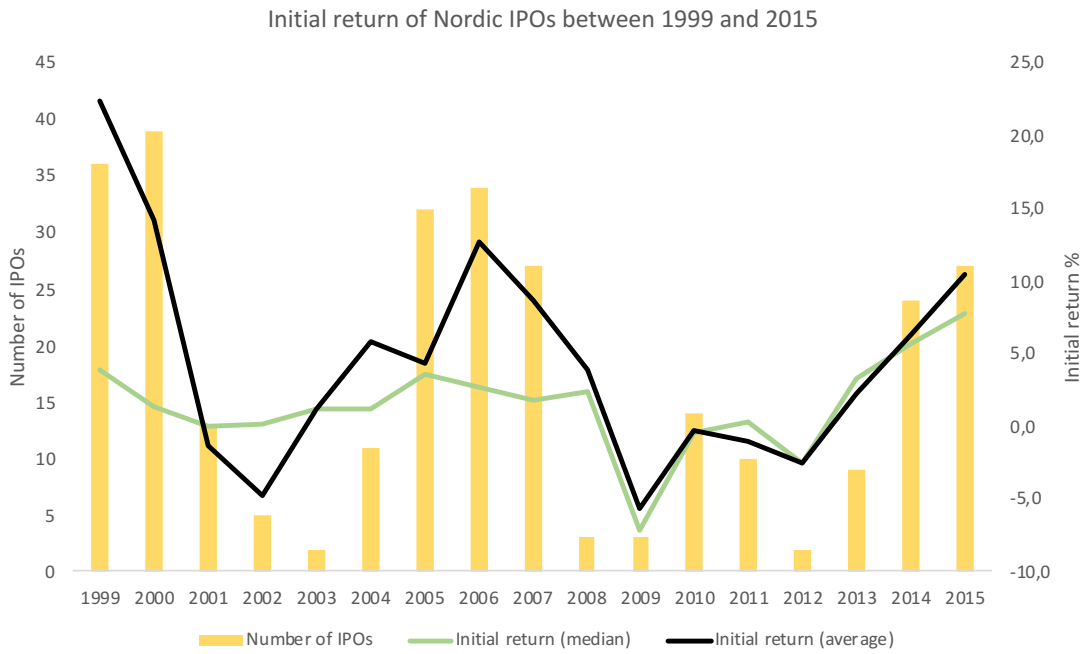

Figure 5. Nordic IPOs and their initial return between 1999 and 2015.

The figure shows that the volume of companies going public has fluctuated significantly which is partly driven by two major events that took place during the sample period. The first one is the dot-com bubble which first drastically increased the popularity of IPOs in the early 2000s, but after the burst of the bubble occurred the number of companies going public declined rapidly (Ghosh, 2006). The second one is the great financial crisis which led to a strong decline in IPO volumes in 2008 (Doidge et al., 2013, p. 553–554). Obviously, these extraordinary events are not the only reason behind fluctuating IPO volumes. For instance, Lowry (2003) documents that prevailing investor sentiment and companies' need for additional capital both have a major impact on the number of firms going public, and hence it is normal that the number of observations varies over time.

The pattern shown in the figure also indicates that there is a positive relationship between IPO volumes and initial returns since it seems that especially average first day returns tend to be much higher when there are more IPOs and vice versa. One potential explanation for this phenomenon is that during times when the general investor sentiment is bullish there are not only more IPOs, but investors also have too high

expectations about the future performance of these companies, which therefore leads to irrationally high stock prices during the first trading day.

Because the sample used in this study contains some companies with extremely high underpricing, they can severely distort the results especially when the country-specific sample sizes are relatively small. In order to tackle this problem, this paper also presents the median initial returns which should give us a more realistic image about the true level of the underpricing in Nordic countries. The importance of this approach is visible in figure 5 where average initial returns differ significantly from the medians during more turbulent times.

Differences in underpricing between Nordic countries

Table 3 offers a more detailed view of the underpricing phenomenon since it shows country-specific values for both SLU and MLU IPOs. It is noteworthy that "All IPOs" include also offerings where the underwriter is unknown and hence the sums of SLU and MLU observations can differ from these values. This table also includes univariate tests that reveal whether the means and medians of SLUs and MLUs are different in a statistically significant way. The equality of means is tested using Welch's t-test, while the equality of medians is analysed by using Mood's median test. Asterisks *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 3. Country-specific initial returns reported separately for SLUs and MLUs.

	All IPOs			**SLU-IPOs**				**MLU-IPOs**			
Variable:	N	Mean	Median	N	Mean	Median	SD	N	Mean	Median	SD
Initial return (%)	291	9,0	2,3	120	**12,1**	2,6	35,8	154	**5,8 ***	1,9	22,6
Initial return Denmark (%)	39	14,6	4,0	20	11,7	**0,0**	40,2	15	10,2	**10,9 ***	11,8
Initial return Finland (%)	46	21,1	3,9	29	20,7	3,7	55,6	8	36,6	6,0	87,9
Initial return Norway (%)	105	2,5	0,2	25	**7,6**	2,2	16,5	80	**1,0 ***	-0,1	8,9
Initial return Sweden (%)	101	8,0	4,2	46	9,4	3,1	24,0	51	7,3	5,7	11,2

As seen in table 3, the average equal-weighted initial return for the whole sample that comprises 291 IPOs is 9,0%, whereas the median is 2,3%. These are significantly lower

numbers than in the U.S. where the corresponding numbers during the same period were 19,0% and 13,3%, respectively (Ritter, 2020). The table also shows that there are notable differences in mean returns between these four Nordic countries. For example, at a first glance, it seems that Finland has the most severe underpricing problem since its average initial return is 21,1% which is much higher than in other countries. However, Finland's median first day return is only 3,9% which is actually lower than in Denmark (4,0%) or in Sweden (4,2%).

Finland's high average is mainly driven by three companies. The first one is F-Secure Oyj since its stock price jumped 253% during the first trading day in 1999, the second one is BasWare Oyj which had an initial return of 234% in 2000 and the third one is Comptel Oyj which yielded 181% in 1999. Each of these firms operated in the technology sector and thus are great examples of how bullish the market sentiment was at the turn of the millennium during the peak of the dot-com bubble. If these companies are excluded from the calculations the average initial return in Finland drops to 7% which proves that due to the small sample size the impact of individual companies can be very substantial.

Another notable observation is that IPOs in Norway yield much less during their first trading-day than their counterparts in other countries. This is in line with the previous literature since it is revealed by Banerjee, Dai and Shrestha (2011, p. 1297) that from 36 countries between the years 2000 and 2006 Norway had the lowest mean and median underpricing. In that study, the average initial return for 45 Norwegian companies was 4,3% whereas the median was 0,8%.

Differences in underpricing between SLU and MLU IPOs

Table 3 also shows that the mean initial return of Nordic IPOs with multiple lead underwriters is approximately 50% lower than the average for offerings with only one lead underwriter. This finding supports the certification hypothesis of Vithanage et al. (2016) which suggests that MLU IPOs should be priced closer to their true value. However, since

the difference is significant only at the 10% level and there seems to be no statistically significant difference in medians, these results should be interpreted with caution.

Similarly, results of the country level univariate analyses reveal that there is not a clear pattern that would support the idea that in Nordic countries MLU IPOs would experience lower levels of underpricing. As seen in the table, Norway and Denmark are the only countries where there are statistically significant differences in the underpricing between SLUs and MLUs. Interestingly, these results are inconsistent with each other since while in Norway additional underwriters seem to reduce the *average* underpricing in Denmark the situation is different and MLUs have a higher *median* initial return. Since both of these results are significant only at the 10% level there is no clear evidence that the size of the lead underwriter syndicate has a different impact in different countries.

As mentioned, the univariate analysis does not indicate any significant differences in initial returns of Finnish or Swedish IPOs. However, it is interesting that in Finland MLUs seem to have higher average but lower median underpricing while in Sweden the situation is the opposite. Mixed results like this suggest that we need to examine this topic more carefully and use regression analyses to find out what are the true factors behind IPO underpricing in Nordic countries.

6.1.2 Initial returns regressions

All Nordic countries

The following regressions include IPOs from all four countries and the sample size varies between 254 and 267 depending on whether or not the model includes VC-backed dummy. These regressions aim to find out the role of the lead underwriters in Nordic IPOs by using several different variables. The first one is *MLU dummy*, a binary dummy that measures how the initial return changes when there are multiple lead underwriters

involved in the IPO process. The alternative option for this binary dummy is the *Number of lead underwriters* which takes into account the actual amount of lead underwriters and not only whether there are more than one of them in the syndicate.

The third one is the *average underwriter reputation* which is based on the idea that underwriters who involve in many offerings, or offerings with high gross proceeds are the most reputed ones. This variable aims to reveal whether highly reputed underwriters somehow affect the performance of these companies during their first day as a publicly-traded company. The fourth underwriter related variable is the *quadratic term* of the *number of lead underwriters* variable, which tries to find out if Nordic IPOs have a similar u-shaped relationship between the number of the underwriters and the initial return, as it is documented by Vithanage et al. (2016) with the companies from the U.S.

In addition to the main variables, these models include other variables that are known to sometimes have an impact on the IPO underpricing such as average stock market return 90 days before the offering and information on whether the company is backed by venture capitalists. Each of these six models also includes country dummies as control variables which aim to eliminate the country-specific effects since country-specific models are introduced later in this chapter. The outcomes of the regressions are presented below in table 4.

Table 4. Regression models explaining the initial return of Nordic IPOs.

	Initial return					
	(1)	(2)	(3)	(4)	(5)	(6)
MLU dummy	-0,018	-0,011	-	-	-	-
	(-0,39)	(-0,22)	-	-	-	-
Number of lead underwriters	-	-	-0,007	-0,005	0,024	0,042
	-	-	(-0,29)	(-0,21)	0,321	(0,53)
Number of lead underwriters^2	-	-	-	-	-0,006	-0,009
	-	-	-	-	-0,505	(-0,73)
Underwriter reputation	-0,014	-0,013	-0,014	-0,013	-0,014	-0,013
	(-0,70)	(-0,63)	(-0,72)	(-0,65)	-0,723	(-0,65)
Log (gross proceeds)	**0,023***	0,023	0,023	0,023	0,022	0,022
	(1,68)	(1,63)	(1,57)	(1,54)	1,49	(1,42)
Log (age +1)	0,005	0,005	0,005	0,005	0,006	0,006
	(0,68)	(0,59)	(0,70)	(0,61)	0,787	(0,74)
Return 90 days before	**0,808*** **	**0,820*** **	**0,807*** **	**0,818*** **	**0,807*** **	**0,821*** **
	(3,45)	(3,38)	(3,40)	(3,34)	3,397	(3,34)
Dot-com bubble	0,032	0,026	0,032	0,026	0,033	0,026
	(0,79)	(0,63)	(0,79)	(0,60)	0,809	(0,61)
Technology	**0,116***	**0,122** **	**0,116***	**0,122** **	**0,115***	**0,122** **
	(1,95)	(2,00)	(1,92)	(2,01)	(1,92)	(2,01)
VC-backed dummy	-	-0,032	-	-0,034	-	-0,041
	-	(-1,12)	-	(-1,12)	-	(-1,43)
Constant	0,030	0,024	0,037	0,028	0,010	-0,012
	(0,17)	(0,13)	0,210	(0,15)	(0,06)	(-0,07)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0,21	0,21	0,21	0,21	0,21	0,21
Adj. R-sq	0,18	0,17	0,18	0,17	0,18	0,17
N	267	254	267	254	267	254

The results are surprising since none of the main independent variables are significant in any of the six models. The coefficients of *MLU dummy* and *Number of lead underwriters* in models 1-2 and 3-4 are all negative which is consistent with the idea of the certification hypothesis (Vithanage et al., 2016, p. 194-195) that MLU IPOs are priced closer to their true value and hence experience lower underpricing. However, the finding that all of these variables are statistically insignificant suggests that Nordic IPOs do not benefit from multiple lead underwriters at least in a similar way than companies in the United States.

The table also shows that there are only two variables that affect the underpricing in all of these six models. The first one is the *return 90 days before* which has positive coefficient and is statistically significant at the 1% level in each model and is therefore also

consistent with the results of Vithanage et al. (2016, p. 200). In practice, this means that the stock market return 3-months before the offering can be effectively used to predict the initial return of a recently listed company in Nordic countries due to the strong positive relationship between them. This finding is not surprising since there are several previous studies such as Derrien (2005), Derrien & Womack (2003) and Loughran & Ritter (2002) which document that initial returns tend to be higher after an upward trend in the stock market.

The second variable that is significant in every model is the *Technology* dummy and also it tends to increase the underpricing of Nordic IPOs even though its statistical importance varies between different models and it never reaches significance at the 1% level. This result might be partially explained by the dot-com bubble when multiple technology companies went public and earned very substantial first day returns. However, the dot-com bubble dummy is not significant in any of these models which might be related to the fact that a large part of companies that went public during that time were technology companies and thus the impact is already captured by the technology dummy.

In addition to these previously mentioned variables, there is only a one control variable that shows any kind of statistical significance, and it is the logarithm of the gross proceeds, which offers a proxy about the size of the offering and since its coefficients are always positive it suggests that larger IPOs tend to have more underpricing. However, this effect is visible only in the first model, and even there the result is just slightly statistically significant at the 10% level and hence it does not offer very reliable evidence about this relationship. This finding is in line with the results of Vithanage et al. (2016, p. 200) since their underpricing regressions reveal that even though the coefficient of the logarithm of IPO proceeds is positive in every model, it does not show any statistical significance.

The finding that neither age of the company nor whether it was backed up by venture capitalists does not affect the underpricing of Nordic IPOs is unexcepted since for example studies of Loughran and Ritter (2004, p. 25) and Vithanage et al. (2016, p. 200) both show that the increase in the age of the issuing company leads to significantly lower first-day returns. However, their results about VC-backed IPOs are in conflict with each other since the models of Loughran and Ritter (2004) find no statistically important relation between them whereas the paper of Vithanage et al. (2016) documents that venture capital backed companies have much higher first-day returns.

Country-level initial returns

Previously presented models used the full sample and hence included companies from every four countries. However, this study is also interested in whether or not the factors behind IPO underpricing phenomenon vary between the countries. To answer to this question, this chapter introduces the main results of the country-specific analyses. The regression tables of these models are presented in the appendix section of this paper.

In general, these models are very similar to the ones used with the full sample since there are only two differences between them. The first one is that these models do not include country dummies since they examine each country individually. The second difference is that regressions analysing Finnish IPOs do not comprise vc-backed dummy since none of the Finnish companies included in the sample are backed up by venture capitalists.

Norway

The sample size varies between 99 and 89 depending on whether or not the model includes vc-backed dummy. The distribution between SLUs and MLUs with the larger sample is 22 and 77, respectively and with the smaller sample 20 and 69.

The results of the regressions suggest that there is an inverse relationship between the number of lead underwriters and the first day returns of Norwegian IPOs since both *MLU dummy* and *number of lead underwriters* have negative coefficients. However, there are differences between these variables since while the statistical significance of the *number of lead underwriters* (in models where the quadratic term is not included) varies between 10% and 5% levels depending on whether the model contains the vc-backed dummy or not, the dummy variable reaches 10% level only in one model. Nevertheless, this finding gives some support to the certification hypothesis of Vithanage et al. (2016) which suggests that IPOs backed up by multiple lead underwriters are generally priced closer to their true value than the offerings with only one lead underwriter.

Analyses also reveal that in addition to MLU dummy and number of lead underwriters the only other statistically significant factor explaining initial returns in Norway is the stock market return 90 days before the offering. However, the effect is not as strong as with the full sample since with Norwegian IPOs the variable is only significant at the 10% level and it becomes insignificant when the model includes the vc-backed dummy.

Sweden

The sample consists of 97 or 94 Swedish IPOs depending on whether or not the model includes the vc-backed dummy and the distribution between SLUs and MLUs is 46 and 51, respectively. The regressions do not reveal a similar relationship between the number of underwriters and first-day returns, as they did with Norwegian IPOs, since neither *MLU dummy* nor *the number of lead underwriters* seem to have any kind of statistically significant impact even though their coefficients are always negative. The results suggest that with Swedish IPOs the most important factor explaining initial return is the stock market return 90 days before the offering, which is significant at the 1% level in every model showing that during hot market conditions also IPOs achieve higher returns during their first trading day.

In addition, two other variables have a mild statistically significant (only at the 10% level) impact on the initial returns. The first one is age of the company since the models suggest that older companies tend to have higher underpricing. This is an interesting finding because there is no similar effect visible with the full sample or with other Nordic countries. This finding is also inconsistent with the results of Vithanage et al. (2016, p. 200) which show that in the U.S. older companies actually have lower initial returns. The other one is *technology dummy* which suggests that technology companies tend to have higher initial return than other IPOs and hence is consistent with the results of the regressions using the full sample.

Finland

In Finland's country-specific analyses the sample size is always 37 and comprises 29 SLUs and 8 MLUs. As in the case of Sweden, the models do not give any statistically significant support to the idea, that the size of the lead underwriter syndicate would affect the underpricing phenomenon. However, it is noteworthy that with the Finnish sample the coefficients of *MLU dummy* and *number of lead underwriters* are positive which is not surprising since the table 3 shows that in Finland both average and median underpricing are higher for MLUs. Finland's models show that once again the most important factor driving the initial return is the market return 90 days before the offering since it has a positive coefficient and a statistical significance that varies between 5% and 10% levels. However, a more interesting result is that Finland is the only country where the *dot-com bubble dummy* seems to have had a statistically significant (at 10% level) impact on the underpricing phenomenon, by increasing initial returns of Finnish IPOs.

Denmark

The sample used in Denmark's initial return regressions includes 34 observations comprising 19 SLUs and 15 MLUs. The models are not able to explain the underpricing

phenomenon in Denmark since coefficients of determination are very low, and none of the independent variables seem to be significant.

6.2 Return volatility

Table 5 shows the mean and median return volatility during the first 21 trading-days, and as before, it includes univariate tests that aim to find out if there are significant differences between SLUs and MLUs. The equality of means is tested using Welch's t-test while the equality of medians is analysed by using the Mood's median test. Asterisks *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 5. Return volatility of Nordic IPOs.

	All IPOs			SLU-IPOs				MLU-IPOs			
Variable (%)	N	Mean	Median	N	Mean	Median	SD	N	Mean	Median	SD
Return volatility	286	4,0	2,6	116	**5,1**	2,7	7,5	153	**3,2 ***	2,4	4,6
Return volatility Denmark	38	4,7	3,1	19	6,2	3,8	8,1	15	3,4	3,2	1,6
Return volatility Finland	46	6,4	2,6	29	6,6	2,6	11,6	8	9,5	2,9	18,1
Return volatility Norway	101	2,9	2,3	22	3,9	2,4	4,6	79	2,6	2,3	1,9
Return volatility Sweden	101	3,7	2,7	46	**4,3**	**3,1**	4,3	51	**3,0 ***	**2,2 ***	2,0

Univariate tests reveal that on average MLU IPOs have more stable stock price development during the first month as a publicly traded company since their mean return volatility (3,2%) is lower than the one of SLU IPOs (5,1%) even though the difference between them is only statistically significant at 10% level. There is also a difference in median values but the median test shows that the difference is not large enough to be significant.

The country-specific comparison shows similar results since in Denmark, Norway and Sweden MLU IPOs have less volatile average and median returns even though Sweden is the only country where these differences have any statistical significance. The only exception here is Finland, where offerings with multiple lead underwriters actually have more volatile returns, compared to their SLU counterparts. This result might be

explained by the fact that the sample of this study has only eight Finnish MLUs and hence individual observations can again change the results drastically. Therefore, univariate tests give some support to the certification hypothesis of Vithanage et al. (2016, p. 195) where they argue that when other things are equal MLU-IPOs have lower variability of returns during the first 21 trading-days. However, since these results are only significant at the 10% level it is important to examine this topic more carefully by using the regression models which hopefully give us a more accurate view of this relationship.

Return volatility regressions

Table 6 presents six regressions models that aim to find the relationship between lead underwriter syndicate structure and return volatility of Nordic IPOs. The models are otherwise identical to the ones shown previously in the chapter analysing initial returns but this time the dependent variable is the return volatility during the first 21 trading-days. The t-values are reported in parentheses. Asterisks *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

These models suggest that there is no connection between lead underwriters and IPO return volatility since neither of the variables measuring the number of lead underwriters or the one measuring their average reputation show any kind of meaningful impact on volatility. According to these regressions, one of the most important factors behind return volatility is the stock market return 90 days before the offering which has a positive coefficient and is highly statistically significant in all six models. In other words, the positive coefficient means that after the rise of the stock market also the volatility of IPOs increases. Another independent variable with a significant impact on volatility is the *technology dummy* which also has a positive coefficient and is shows statistical significance at the 1% level in all models. In addition to these two variables, also *dot-com bubble dummy* shows mild significance in models (1), (3) and (5) which do not include the *vc-backed dummy*.

Table 6. Regression models explaining the return volatility of Nordic IPOs.

	Return volatility					
	(1)	(2)	(3)	(4)	(5)	(6)
MLU dummy	-0,003	-0,004	-	-	-	-
	(-0,35)	(-0,40)	-	-	-	-
Number of lead underwriters	-	-	0,003	0,002	-0,003	-0,003
	-	-	(0,58)	(0,48)	(-0,20)	(-0,17)
Number of lead underwriters^2	-	-	-	-	0,001	0,001
	-	-	-	-	(0,50)	0,41
Underwriter reputation	-0,005	-0,005	-0,004	-0,005	-0,004	-0,005
	(-1,16)	(-1,16)	(-1,12)	(-1,12)	(-1,11)	(-1,12)
Log (gross proceeds)	0,000	0,000	-0,001	-0,001	-0,001	-0,001
	(0,03)	(0,08)	(-0,48)	(-0,40)	(-0,41)	(-0,34)
Log (age +1)	0,001	0,001	0,001	0,001	0,001	0,000
	(0,54)	(0,40)	(0,45)	(0,32)	(0,38)	(0,26)
Return 90 days before	**0,142*** **	**0,147*** **	**0,144*** **	**0,149*** **	**0,144*** **	**0,149*** **
	(2,92)	(2,93)	(2,95)	(2,96)	(2,95)	(2,96)
Dot-com bubble	**0,013***	0,011	**0,014***	0,012	**0,014***	0,012
	(1,81)	(1,44)	(1,93)	(1,52)	(1,87)	(1,51)
Technology	**0,032*** **	**0,033*** **	**0,031*** **	**0,032*** **	**0,032*** **	**0,032*** **
	(2,67)	(2,69)	(2,62)	(2,67)	(2,64)	(2,66)
VC-backed dummy	-	-0,008	-	-0,008	-	-0,007
	-	(-1,43)	-	(-1,36)	-	(-1,34)
Constant	**0,067***	**0,069***	**0,064***	**0,068***	**0,069** **	**0,072** **
	(1,94)	(1,94)	(1,88)	(1,90)	(2,08)	(2,09)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0,24	0,24	0,24	0,24	0,24	0,24
Adj. R-sq	0,21	0,20	0,21	0,20	0,20	0,20
N	267	254	267	254	267	254

The results of these regressions differ from the ones documented by Vithanage et al. (2016, p. 200) since their models reveal a negative relationship between multiple lead underwriters and volatility of IPOs. On the other hand, their paper does not show any relationship between previous stock market return and IPO volatility which is interesting since the impact is so clear in Nordic countries. Therefore, it can be summarized that the results of univariate tests and more complex regression models do not offer us clear evidence about the inverse relationship between the number of lead underwriters involved in the offering and the volatility of the IPO company during the 21 first trading-days.

7 Analysis of the long-term performance

This chapter introduces the empirical findings of the long-term performance of Nordic IPOs between the years 1999 and 2015 in a similar way that was done with underpricing in the previous chapter. As described earlier in the data & methodology, this paper uses buy-and-hold abnormal return (BHAR) to measure the long-term performance of Nordic IPOs against different benchmark indices. Even though most of the analyses are done using 36-month BHAR this study also examines other time periods to find out if the performance of these companies tends to vary over time. The three main targets of this chapter are the following. Firstly, it aims to find out what are the main factors affecting the long-term performance of Nordic IPOs. Secondly, it strives to reveal if there are any significant differences in BHARs between Danish, Finnish, Norwegian and Swedish companies. The third and most important goal is to find out how does the structural change from SLUs to MLUs has impacted the long-term performance of IPOs.

This study uses univariate tests and multiple regressions models to offer answers to these questions. After that, the results are compared to the ones documented in the previous literature to give us a better view of how does the performance of Nordic IPOs differ from other countries and especially if the effect of multiple lead underwriters is different than it is reported by Vithanage et al. (2016) with U.S. companies.

7.1 Overview of the long-term performance

Table 7 reveals BHARs against various benchmark indices used in this study and also shows the split between SLU and MLU IPOs. In addition to that, it uses univariate tests to point out if there are statistically significant differences in the mean and median long-term performance between these two sub-groups. The equality of means is tested using two tailed t-test or Welch's t-test depending on which one is more suitable, while the

equality of medians is analysed by using the Mood's median test. Asterisks *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Similar to table 3 in the previous chapter, column "All IPOs" includes also those offerings where the lead underwriter is unknown, and hence the sum of SLU and MLU observations does not always match up to that figure. For some indices, there are both price index (PI) and total return index (RI) versions which makes it possible to compare how potential cash distributions, for instance dividends, affect the BHAR against these benchmarks.

Table 7. Long-term performance of Nordic IPOs.

	All IPOs			SLU-IPOs				MLU-IPOs			
Variable (%)	N	Mean	Median	N	Mean	Median	SD	N	Mean	Median	SD
BHAR36 MSCI Europe (RI)	283	5,8	-11,3	115	**-4,9**	**-31,8**	84,8	153	**16,6****	**7,0*****	88,3
Denmark	35	-12,2	-37,5	18	-25,3	-41,0	53,4	15	21,9	-6,6	107,0
Finland	46	-8,5	-24,0	29	-6,4	-11,3	59,7	8	-11,1	-19,9	55,8
Norway	101	6,2	-15,1	22	**-27,5**	**-56,5**	68,3	79	**15,6****	**3,2***	100,7
Sweden	101	10,1	5,6	46	1,9	**-23,1**	109,2	51	15,6	**25,8****	63,8
BHAR36 MSCI Europe (PI)	284	7,5	-9,2	116	**-1,4**	**-27,2**	80,6	153	**16,6***	**11,3*****	79,2
Denmark	36	-5,9	-28,9	19	-16,4	-28,4	52,0	15	15,2	-14,4	104,3
Finland	46	-7,9	-22,8	29	-5,6	-10,5	54,0	8	-10,7	-18,3	49,8
Norway	101	6,6	-9,0	22	**-22,3**	**-51,9**	65,0	79	**14,7****	**3,6***	88,1
Sweden	101	12,6	7,0	46	5,4	**-18,6**	105,2	51	17,3	**25,9****	58,4
BHAR 36 OMX Nordic 40 (PI)	197	10,5	3,4	65	1,0	**-16,3**	73,2	126	17,5	**16,6****	77,1
Denmark	24	-23,2	-36,3	12	-26,1	-28,2	42,1	10	-10,8	-30,1	51,7
Finland	16	18,7	11,5	13	13,1	6,8	62,4	3	43,1	43,6	36,7
Norway	90	6,7	-7,0	19	-17,6	**-39,1**	66,9	71	13,2	**0,8***	92,5
Sweden	67	11,3	28,6	21	1,7	13,6	91,0	42	15,9	35,6	49,3
Denmark:											
BHAR36 OMXC20 (PI)	36	-22,7	-45,2	19	-32,2	-44,8	51,8	15	-1,5	-41,2	96,7
BHAR36 OMXC_CAP (RI)	35	-27,0	-46,2	18	-38,6	-42,5	55,5	15	-4,2	-42,0	100,8
Finland:											
BHAR36 OMXH25 (PI)	46	-8,5	-15,6	29	-2,6	-8,9	45,4	8	-13,1	-28,6	47,3
BHAR36 OMXH (RI)	46	-9,8	-19,9	29	0,9	-5,4	50,7	8	-18,5	-31,2	53,7
Norway:											
BHAR36 OBX (RI)	101	-6,1	-20,1	22	**-34,1**	**-58,3**	65,7	79	**1,7***	**-17,3***	101,9
BHAR36 OBX (PI)	101	-3,6	-19,1	22	**-28,1**	**-53,3**	62,2	79	**3,2***	**-9,7***	88,3
Sweden:											
BHAR36 OMXS30 (PI)	101	19,6	9,6	46	19,2	**-7,5**	103,1	51	23,1	**32,3****	52,1
BHAR36 OMXS30 (RI)	67	19,6	13,1	21	20,2	3,7	96,9	42	24,0	29,5	56,0

7.1.1 Comparison against MSCI Europe and OMX Nordic 40

MSCI Europe

As mentioned earlier, the most important index used in this study is MSCI Europe since it can be used as a benchmark against every IPO in the sample and due to its importance, table 7 includes both price index and total return index versions of it to see whether BHARs differ between them. The table does not give us an unambiguous answer whether or not IPOs are poor long-term investments since (with the full sample) the average 36-month BHAR is positive while the median is negative. This finding is not dependent on which version of the index is used because the pattern is similar with RI and PI versions of the index.

A country-level analysis against these same indices indicates that in general Swedish IPOs tend to perform much better than others, which therefore also strongly drives the results since Swedish companies form over one-third of the full sample of this paper. For example, when the median BHARs against MSCI Europe RI for Denmark, Finland and Norway are -37,5%, -24% and -15,1%, respectively, Swedish IPOs beat the benchmark by 5,6%. The gap between Swedish companies and other Nordic IPOs is slightly smaller when BHARs are measured using mean values since while IPOs still tend to underperform the index in Denmark (-12%) and Finland (-9%) in Norway and Sweden they outperform it by 6% and 10%, respectively. The very notable difference between average and median BHARs in Norway is most likely driven by a small group of companies that have performed extremely well during the observation period. For example, the best performing Norwegian IPOs such as ODIM ASA (565%) and Awilco ASA (401%) affect its average BHAR dramatically especially when the sample size is only 101.

The great performance of Swedish IPOs is an interesting result since the study of Thorsell and Isaksson (2014, p. 13) documents that the average 12-month BHAR and 24-month BHAR for Swedish IPOs listed between January 1996 and September 2006 were 19,3% and 0,8%, respectively, whereas both of the median values were roughly -10%.

However, since their study has different sample, uses a different benchmark index and does not report 3-year BHAR their results are not directly comparable to the ones reported in this paper.

A very important finding revealed by the table 7 is that there are significant differences in 36-month BHARs between SLU and MLU IPOs. For instance, the comparison against the total return index reveals that Nordic offerings backed up by only one lead underwriter typically underperform their benchmark index while MLUs actually tend to have higher returns. The difference between these two groups is more visible when BHAR is calculated using median values (significant at the 1 % level) since with mean values it is only significant at the 5 % level.

However, a country-level univariate analysis suggests that also this relationship between the number of lead underwriters and IPO long-term performance varies between these four Nordic countries. For instance, Norway has the largest variation between MLUs and SLUs since comparisons against both MSCI Europe benchmarks reveal significant differences in both mean and median figures. However, the impact seems to be stronger in mean values since these results are statistically significant at the 5% level whereas differences in medians are only slightly significant at the 10% level. The situation is the opposite in Sweden since univariate tests indicate that MLUs have higher median BHARs, and the result is significant at the 5% level, but the effect disappears when the performance is measured by using the average value.

Interestingly, in Finland MLUs actually perform worse than IPOs with only one lead underwriter even though there is no statistical significance which would support the robustness of this finding. One potential explanation for this surprising result might be the fact that the sample used in this comparison is not very large and it contains only eight Finnish companies with multiple lead underwriters and hence the impact of individual observations on the final results is quite significant. Finally, table 7 shows that even though there is a quite large gap between the BHARs of Danish SLUs and MLUs,

univariate tests do not show any statistical significance which might be once again related to the relatively small sample size.

OMX Nordic 40

Table 7 points out that when the full sample is used Nordic IPOs have outperformed the OMX Nordic 40 price index by 10,5% (mean) or 3,4% (median). However, more careful analysis reveals that this finding is driven by a great performance of MLU IPOs since the median 36-month BHAR for SLUs is actually -16,3% while for MLUs it 16,6%. This difference is statistically significant at the 5% level with a p-value of 0,025 and thus gives support to the idea that the structure of the underwriter syndicate affects the long-term performance of Nordic IPOs in a way that is in line with the certification hypothesis of Vithanage et al. (2016).

Country-level results against OMX Nordic 40 suffer even more from the small sample size because the total number of observations with the required information about the lead underwriter syndicate drops to 191, which especially impacts Finland and Denmark since they already had fewer observations than Norway or Sweden. In fact, the table 7 shows that there are practically no statistically significant country-level differences between BHARs against OMX Nordic 40 index. The only exception is Norway where the median BHAR for MLUs is 0,8% whereas for SLUs and the full sample it is -39,1% and -7%, respectively. This difference is significant at the 10% level and gives more support to the idea that offerings backed up by multiple lead underwriters perform better than their SLU counterparts.

7.1.2 Comparison against country-specific indices

In addition to these previously mentioned indices, this study also uses several country-specific ones that give us additional information about the long-term performance of Nordic IPOs. The advantage of these indices is that they offer a more realistic view about

the true abnormal return during the 3-year holding period because these benchmarks only contain firms from the same country. The comparison against these indices supports the idea that IPOs are poor long-term investments since Swedish IPOs are the only ones that can beat their benchmark indices and thus seem to be good investments while in other countries investors would have earned higher returns if they would have simply invested in the stock index.

Also the comparison between SLUs and MLUs against country specific indices offers results that are consistent with the previous findings since once again Norway and Sweden are the only countries where MLUs outperform SLUs in a statistically meaningful way. With Norwegian companies, the differences in mean and median BHARs against both versions of the OBX index are significant at the 10% level, while in Sweden companies with multiple lead underwriters have a better performance against OMXS30 price index and the difference is significant at the 5% level. Interestingly, the analysis does not reveal similar results against the total return index version of OMXS30 which might be due to the fact that there are no values for this version of the index before the year 2002 and thus it excludes the oldest IPOs from the comparison. In practice, this means that it does not take into account companies that went public around the dot-com bubble at the turn of the millennium when SLUs were more popular which could explain the difference in buy-and-hold abnormal return.

These results give partial support to the univariate tests of Vithanage et al. (2016, p. 198) since they document that companies with more than one lead underwriter involved in the listing process often perform better than other IPOs during the first three years as a publicly-traded company. However, the fact that the results between Nordic countries are inconsistent with each other makes it difficult to make any final conclusions about the true relationship between the number of underwriters and the long-term performance of these companies. Therefore, these findings highlight the importance to analyse this phenomenon using multiple regression analyses which will be done later in this study.

7.2 Long-term performance between different estimation periods

Figures 6 and 7 show the median and average BHAR against MSCI Europe total return index over 6, 12, 24 and 36 months. As documented previously in table 7 the median long-term performance of Nordic IPOs is constantly worse than the average due to the small group of companies that have performed extremely well during their observation period.

Both figures reveal that the BHAR of Nordic IPOs tends to decline over time. The phenomenon is particularly clear in the figure that presents the median values since after 24 months Swedish firms are the only ones that are able to beat their benchmark index and actually show positive development after 24 months. Another interesting finding is that figure 7 demonstrating average BHARs suggests that Finnish IPOs have an outstanding performance during their first 12 months as a publicly listed companies and outperform MSCI Europe on average by 70%. However, this result is explained by the extremely good performance of small group of Finnish technology companies during the peak of the dot-com bubble which due to the small sample size affects the outcome significantly and hence there is no similar situation with median BHARs.

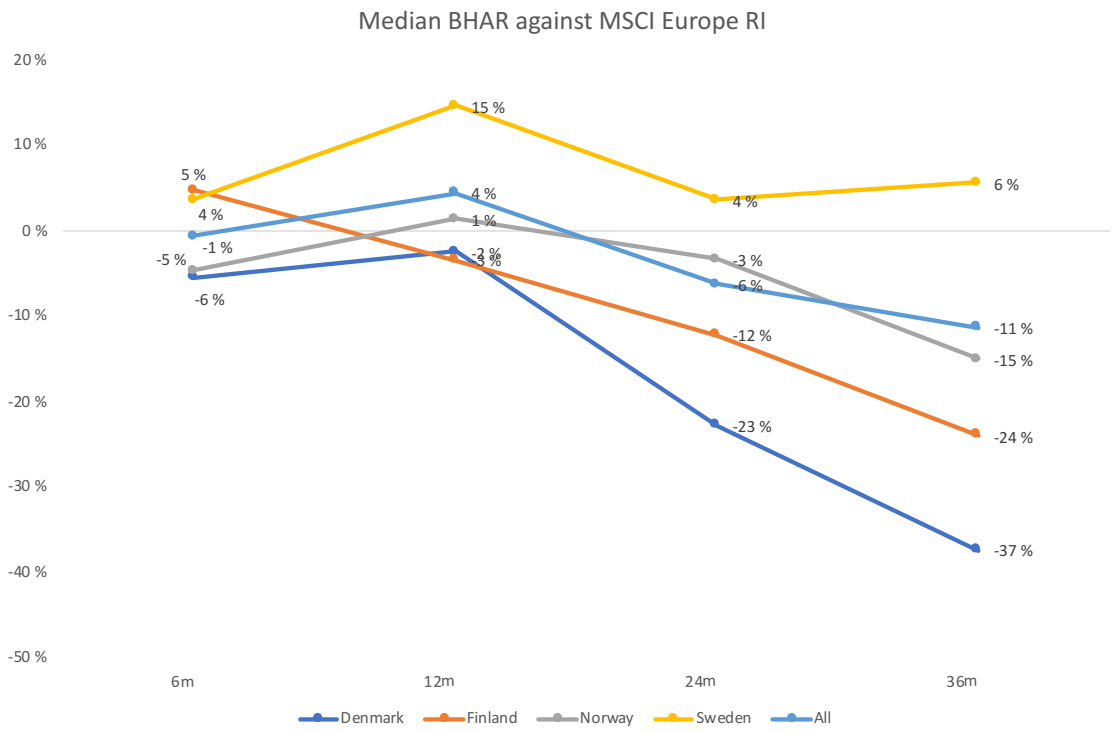

Figure 6. Median BHAR of Nordic IPOs against MSCI Europe total return index.

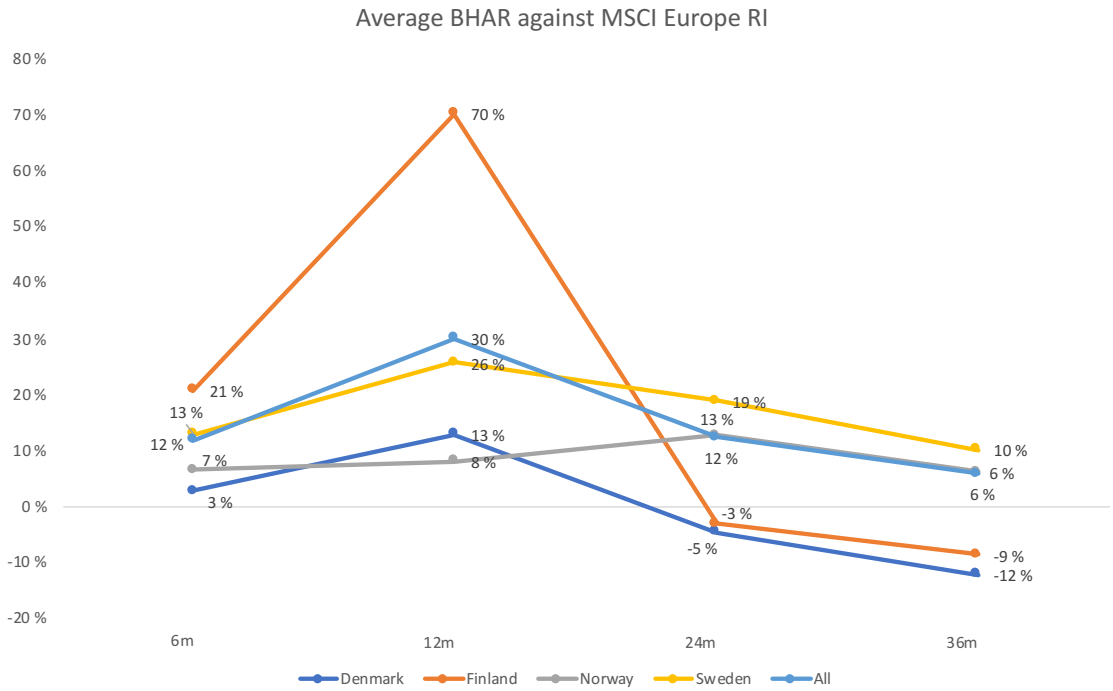

Figure 7. Average BHAR of Nordic IPOs against MSCI Europe total return index.

Figure 8 shows the median BHARs of Nordic IPOs against the OMX Nordic 40 price index. This time the results vary more between countries since now both Finnish and Swedish IPOs outperform their benchmark index during the 3-year observation period and there is no similar consistent decline after 12 months as observed with MSCI Europe.

The differences in these results can be caused by many different things and the most obvious one is that the performance of these benchmark indices differs from each other. It is also possible that other factors impact this comparison. For instance, it is possible that since OMX Nordic 40 does not take dividends into account it makes Nordic IPOs look like better investments than they truly are. The idea behind this argument is that old and more stable publicly listed companies could potentially pay more dividends to their shareholders compared to firms that have just conducted an IPO, but this phenomenon is not visible in the price index. Another potential explanation is that the differences are caused by the much smaller sample than the one used with MSCI Europe and that it excludes companies that went public around the dot-com bubble

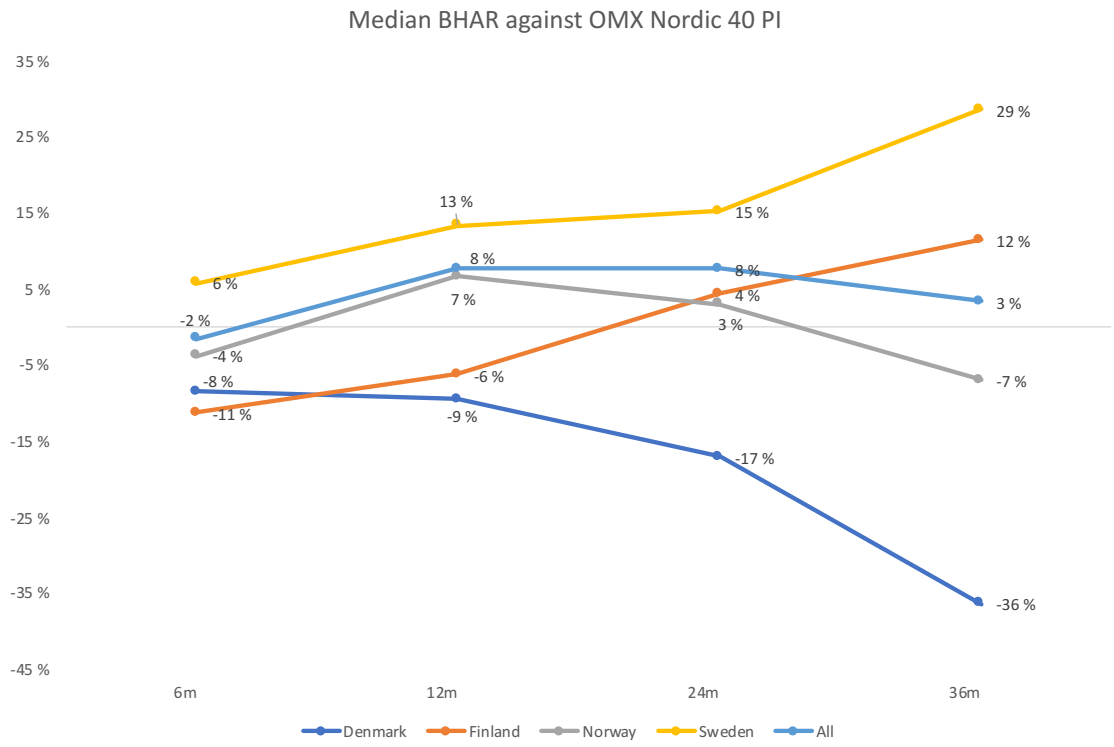

Figure 8. Median BHAR of Nordic IPOs against OMX Nordic 40 price index.

7.3 Regression models analysing the long-term performance

This chapter presents several models that aim to find out whether the second hypothesis of this paper is correct and the number of lead underwriters in the syndicate truly has a positive relationship with the long-term performance of Nordic IPOs. This chapter is divided into two subchapters, the first examines the full sample and the second concentrates on country-specific findings.

7.3.1 All countries

The main point of interest in long-term performance regressions is the 36-month buy-and-hold abnormal return against MSCI Europe Index. This paper uses 3-year observation period to calculate BHARs because it is commonly used in the previous IPO literature which hence makes the results more comparable. There are significant benefits associated with the MSCI Europe since unlike OMX Nordic 40, it has been started before 1999, and thus it covers the whole sample period. The other advantage is that since it is a European index and not country-specific, it can be used as a benchmark against IPOs from each country. Despite this, the study also includes multiple other models since the measurement of IPO long-term performance is heavily affected by the chosen benchmark and thus the use of alternative indices makes the results more robust (Loughran & Ritter, 1995, p. 35).

BHAR36 MSCI Europe

Table 8 consists of six models which are very similar but differ from each other in the following way; Model (1) uses *MLU dummy* variable to capture the impact of multiple lead underwriters, model (3) replaces it with *Number of lead underwriters*, while model (5) is otherwise identical to the third one but adds also the quadratic term of the same variable. Models (2), (4) and (6) are otherwise the same models as (1), (3) and (5),

respectively, but also include a dummy variable that reveals whether the IPO was backed up by venture capitalists. The reason for these separate models is that the inclusion of this extra variable decreases the sample size from 266 to 253 since there is no available information about the possible venture capitalist involvement for 13 of these offerings.

Table 8. 36-month BHAR of Nordic IPOs against MSCI Europe (RI).

	BHAR36 MSCI (RI)					
	(1)	(2)	(3)	(4)	(5)	(6)
MLU dummy	**0,225***	**0,280****	-	-	-	-
	(1,78)	(2,16)	-	-	-	-
Underwriter reputation	-0,003	0,025	0,001	0,027	0,001	0,027
	(-0,08)	(0,76)	0,034	(0,82)	(0,03)	(0,82)
Number of lead underwriters	-	-	**0,100***	**0,100***	0,158	0,259
	-	-	(1,86)	(1,86)	(0,80)	(1,26)
Number of lead underwriters^2	-	-	-	-	-0,011	-0,029
	-	-	-	-	(-0,32)	(-0,84)
Initial return	0,001	0,000	0,001	0,000	0,001	0,000
	(0,58)	(0,36)	(0,59)	(0,37)	(0,57)	(0,31)
Log (gross proceeds)	-0,065	-0,065	-0,071	-0,064	-0,073	-0,069
	(-1,24)	(-1,19)	(-1,38)	(-1,20)	(-1,38)	(-1,26)
Dot-com bubble	0,096	0,052	0,097	0,056	0,099	0,058
	(0,55)	(0,30)	(0,55)	(0,32)	(0,56)	(0,33)
Technology dummy	**-0,324****	-0,235	**-0,31****	-0,234	**-0,316****	-0,232
	(-2,07)	(-1,51)	(-2,01)	(-1,49)	(-2,01)	(-1,48)
Log (age +1)	**0,194*****	**0,200*****	**0,190*****	**0,197*****	**0,192*****	**0,200*****
	(3,13)	(3,12)	(3,06)	(3,03)	(3,04)	(3,04)
VC-backed dummy	-	**-0,408*****	-	**-0,351*****	-	**-0,375*****
	-	(-3,02)	-	(-2,64)	-	(-2,67)
Constant	-0,273	-0,490	-0,361	**-0,579***	-0,411	**-0,714****
	(-0,78)	(-1,64)	(-1,03)	(-1,95)	-1,074	(-2,21)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0,10	0,13	0,10	0,12	0,10	0,13
Adj. R-sq	0,07	0,09	0,07	0,08	0,06	0,08
N	266	253	266	253	266	253

The results of these regressions support the idea that there is a positive relationship between the number of lead underwriters and the long-term performance of Nordic IPOs since in models (1)-(4) the coefficient for the variable that is used to measure the impact of multiple underwriters is positive and also statistically significant. For instance, models (1) and (2) suggest a 22,5% and 28% increase in 36-month BHAR for MLU IPOs compared to SLUs. However, the statistical significance of these models is not very strong since the model (2) is the only one where the result is significant at 5% level while

others are only significant at 10% level. Interestingly, the variable that measures the average reputation of the underwriters involved in the offering is not even close to being significant in any of these models which is inconsistent with the findings of Vithanage et al. (2016).

The results of the models (5) and (6) reveal that the long-term performance of Nordic IPOs does not become significantly worse when the quadratic term of the *number of lead underwriters* is included in the regressions. The reason for this is that even though the coefficients are negative in both models their t-statistics are very low which makes them statistically insignificant and hence it seems that Nordic IPOs do not have similar non-linear inverted U-shape relation between the lead underwriter size and the long-term performance as it is reported for US companies by Vithanage et al. (2016, p. 204). In other words, these results do not give support to the idea that the certification role of MLUs weakens when the size of the lead underwriter syndicate becomes too large.

In addition to those underwriter-related variables, the table also shows connection between other factors and IPO long-term performance. For instance, it reveals that older companies tend to perform better since the coefficient of *log(age+1)* is positive and statistically significant at 1% level in all six models which is not a surprising finding since the same result is reported by multiple other papers such as Ritter (1991), Dong et al. (2011) and Vithanage et al. (2016). There is also a negative and statistically significant relationship between BHAR and technology dummy in models (1), (3) and (5). However, when the VC-backed dummy is added in models (2), (4) and (6), that connection loses its significance and instead of it these models show a negative relationship between venture capitalists and long-term performance which is statistically even stronger than the one with technology dummy.

BHAR36 OMX Nordic 40

Regression models used to analyse the performance of Nordic IPOs against OMX Nordic 40 price index are otherwise identical to the ones used with MSCI Europe but this time none of the models include dot-com bubble variable. The reason for this is that the index was launched on 28.12.2001 and hence the comparison does not include any companies that went public during the bubble period. Therefore, the sample size is smaller than before and varies between 190 and 177, depending on whether or not the model includes the VC-backed dummy.

Table 9. 36-month BHAR of Nordic IPOs against OMX Nordic 40.

	BHAR36 OMX Nordic 40 (PI)					
	(1)	(2)	(3)	(4)	(5)	(6)
MLU dummy	**0,230***	**0,264****	-	-	-	-
	(1,81)	(2,02)	-	-	-	-
Underwriter reputation	-0,012	0,018	-0,003	0,025	-0,004	0,023
	(-0,28)	(0,45)	(-0,08)	(0,62)	(-0,09)	(0,57)
Number of lead underwriters	-	-	0,073	0,063	0,087	0,180
	-	-	(1,56)	(1,34)	(0,51)	(1,02)
Number of lead underwriters^2	-	-	-	-	-0,002	-0,020
	-	-	-	-	(-0,09)	(-0,72)
Initial return	**0,007***	**0,006***	**0,007***	**0,006***	**0,007***	**0,006***
	(1,70)	(1,72)	(1,70)	(1,71)	(1,70)	(1,70)
Log (gross proceeds)	-0,047	-0,036	-0,050	-0,030	-0,050	-0,033
	(-0,80)	(-0,59)	(-0,83)	(-0,49)	(-0,81)	(-0,52)
Technology dummy	-0,065	0,072	-0,028	0,108	-0,029	0,100
	(-0,36)	(0,42)	(-0,16)	(0,63)	(-0,16)	(0,59)
Log (age +1)	**0,121****	**0,130****	**0,120****	**0,131****	**0,120****	**0,133****
	(2,33)	(2,43)	(2,28)	(2,37)	(2,24)	(2,35)
VC-backed dummy	-	**-0,328****	-	**-0,295****	-	**-0,307****
	-	(-2,38)	-	(-2,15)	-	(-2,16)
Constant	-0,381	**-0,651****	-0,492	**-0,765****	-0,501	**-0,845****
	(-1,06)	(-2,12)	(-1,34)	(-2,47)	(-1,22)	(-2,41)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0,11	0,14	0,10	0,12	0,10	0,12
Adj. R-sq	0,06	0,08	0,06	0,07	0,05	0,07
N	190	177	190	177	190	177

The results of the regressions are shown in table 9 and the main findings are the following. First of all, similar to the BHAR regressions against MSCI Europe, the *MLU dummy* has a positive coefficient and is statistically significant at the 10% and 5% levels in models

(1) and (2), respectively. However, this time *Number of lead underwriters* does not show even a weak statistical significance in any of the models even though the coefficient is positive. In general, the examination of these underwriter related variables shows very similar results to the ones achieved with MSCI Europe since the table does now provide any support to the idea that better performing IPOs are associated with highly reputed underwriters or that the long-term performance would suffer if the lead underwriter syndicate grows too much. Similarly, each of the models suggest that the age of the firm has a positive relationship with the long-term performance while IPOs backed up by venture capitalists tend to perform worse than others. The statistical significances of these variables are not as high as they were against MSCI Europe, but the results still strongly indicate that these factors truly affect the performance of recently listed companies.

However, there are also some clear differences compared to the previous results and probably the most surprising one is the *initial return* variable which has a positive and statistically significant (only at 10% level) coefficient in every model. This is an unexpected result because the previous models did not show a similar relationship between the return achieved during the first trading day and the long-term performance. Also, the results of the technology dummy are different since the table shows that it has no statistically significant impact in any of the six models even though it was significant in some of the previous models against MSCI Europe index. This finding is most likely related to the fact that OMX Nordic 40 regressions do not include technology companies that went public around the dot-com bubble since these IPOs had a relatively poor BHARs because when the burst of the bubble occurred stock prices generally went down.

7.3.2 Country-specific regressions

These models are very similar to the ones used with the full sample since there are only two differences between them. The first one is that these models do not include country dummies since they examine each country individually. The second difference is that regressions analysing Finnish IPOs do not comprise vc-backed dummy since none of the Finnish companies included in the sample are backed up by venture capitalists. The main problem with these models, especially the ones examining the performance of Finnish and Danish IPOs, is the very limited number of observations which hence reduces the robustness of the results. Besides, the presentation of all these models in separate tables would take up too much space and thus this chapter only goes briefly through the most important results while the full models can be found in the appendix section of this paper.

Norway

These models examine 36-month BHAR of Norwegian IPOs against MSCI Europe and Oslo OBX total return indices. The results give support to the idea that offerings with multiple lead underwriters truly outperform other IPOs since the coefficient of *MLU dummy* is positive in every model even though its statistical significance varies between 10% and 5% levels, depending on whether the vc-backed dummy is included in the model or not, respectively. As in the models that use the full sample, the explanatory power of the *number of lead managers* is not as high as the dummy variable since although it has positive coefficient it has any statistical significance (and only at the 10% level) only in one model. In the same way, as in the full sample, there is no statistically significant evidence of a non-linear inverted U-shape relationship between the number of lead underwriters and BHARs.

In addition, there are four other variables that have any statistical significance in these models explaining the long-term performance of IPOs in Norway. In general, the most

significant one is the *vc-backed dummy* which has a negative coefficient in every model and its level of significance varies between 5% and 10% and hence implies that offerings backed up by venture capitalists tend to have worse long-term performance than other IPOs. The other variable that has a negative impact on the BHAR in some of the models is *dot-com bubble dummy* which is a surprising result since there were no similar results with the full sample.

Other two variables which have any statistically significant impact are *initial return* and *age* which both have a positive relationship with the BHAR of Norwegian companies. However, significance levels of these variables do not exceed 10% in any of these models and hence the relationships do not seem to be very strong. Underwriter reputation or technology dummy cannot explain the long-term performance in any of these models.

Sweden

Swedish IPOs are compared against MSCI Europe (RI) and OMXS30 (PI). The reason why this paper does not use the total return index version of OMXS30 is that due to missing historical values of this index the sample size would drop only to 63 observations while now the sample size varies between 97 and 94.

First of all, the *number of lead underwriters* explains the performance of Swedish IPOs much better than its alternative *MLU dummy*. The first one has a positive coefficient and is statistically significant (at 10% level) in every model which do not include the quadratic term while the dummy variable becomes only significant (at 10% level) when the model also comprises vc-backed dummy. This result differs from the one achieved with the full sample where the *MLU dummy* was the more significant independent variable but also gives support to the hypothesis that MLU IPOs do have a better long-term performance than SLU IPOs. As previously, there is no statistically significant evidence of a non-linear inverted U-shape relationship between the number of lead underwriters and BHARs.

The analysis of other independent variables shows that the age of the company and initial return both have a positive relationship with the 36-month BHAR, but as expected based on the previous results, the statistical significance of age is much higher. On the other hand, models also reveal that size of the offering, technology dummy and vc-backed dummy all have negative coefficients and are statistically significant in almost every model. However, the importance of the offer size variable notably decreases or completely disappears after adding the vc-backed dummy which is statistically significant at the 1% level in almost every model. Underwriter reputation or dot-com bubble dummy cannot explain the long-term performance in any of these models.

Finland

Regression models analysing the factors behind the long-term performance of Finnish IPOs use MSCI Europe and OMXH total return indices as their benchmarks. These models suggest that in Finland the impact of multiple lead underwriters to the BHAR is actually negative and hence not in line with the results achieved with Norway or Sweden or with the study of Vithanage et al. (2016). This effect is more clearly visible when the models include the *number of lead underwriters* instead of *MLU dummy* since the latter one is not statistically significant in any of these models. One possible explanation for this result is once again the fact that the models use a relatively small sample that contains only 8 MLUs and thus individual observations can have a significant impact on the results.

In addition to the number of lead underwriters, t*echnology dummy* is the only other independent variable that has any statistically significant impact (varies between 5% and 10% level) on the long-term performance of Finnish IPOs since the results suggest that companies that operate on a technology sector underperform other IPOs during their first 36 trading-months. In other words, this means that underwriter reputation, size of the offering, dot-com bubble, or age of the company going public do not have a clearly visible effect on the long-term performance of Finnish IPOs.

Denmark

Danish IPOs are compared against MSCI Europe (RI) and OMX Copenhagen CAP (RI) indices. The sample size is always 33 and it comprises 15 MLUs and 18 SLUs. The results are not in line with the previous country-specific analyses since the adjusted R-squared is negative which hence means that these models clearly fail to explain the long-term performance of IPOs conducted in Denmark. In addition, there is only one variable that shows any kind of statistical significance. It is the *number of lead underwriters* that has positive coefficient and is significant at the 10% level when the performance of these companies is compared against OMXC CAP and the model does not contain the quadratic term of it. Therefore, despite the otherwise poor results these models give once again some support to the hypothesis that MLU IPOs have better long-term performance.

8 Conclusion

The goal of this study was to find out the main factors affecting the stock market performance of Nordic initial public offerings issued between 1999 and 2015 and especially reveal if the number of lead underwriters involved in the offering has any impact on it. Following the previous literature, this study splits the performance of IPOs to short-term performance measured by the initial return and to long-term performance measured by 36-month buy-and-hold abnormal return. The data used in this paper shows that similar to the U.S., the underwriter syndicate structure has notably changed after the turn of the millennium since while in 1999 the average number of lead underwriters was 1,4 in 2015 it had jumped to 2,5. Even more noteworthy is that during the last five years of the dataset, the proportion of larger syndicates has increased significantly, and in 2015 almost one-fourth of Nordic IPOs were managed by at least four lead underwriters.

At a first glance, there seems to be a vast amount of variation in the short-term performance between these four countries. For instance, while the average underpricing for the whole sample is 9,0%, the phenomenon is much more visible in Finland where the average figure is 21,1%. On the other hand, in Norway, the corresponding figure is only 2,5%. However, more careful examination reveals that these large differences might be primarily driven by individual observations since median initial returns of Denmark, Finland, Norway and Sweden are 4%, 3,9%, 0,2% and 4,2%, respectively and hence much closer to each other than first suggested by average figures.

Univariate tests performed in the sixth chapter indicate that there are differences in the first day returns between SLU and MLU IPOs since while the average initial return for SLUs is 12,1% it is only 5,8% for MLUs which is in line with the first hypothesis that suggests that MLUs have less underpricing. However, hence the difference in mean returns is statistically significant only at the 10% level and there is only a small difference between median values this does not offer very robust evidence about this relationship. In addition, this study also finds out that the impact of multiple lead underwriters is highly

dependent on the country since while in general MLU IPOs tend to have lower average initial returns, the situation is the opposite in Finland, where the mean first-day return for MLUs is 36,6% which is much higher than for their SLU counterparts (20,7%). However, this might be also driven by a small sample size since the dataset used in this study only comprises 8 MLU IPOs from Finland and hence individual observation can have a significant impact on the results.

In the full sample, the average and median 36-month BHARs against MSCI Europe total return index are 5,8% and -11,3%, respectively. However, there are clear country-specific performance differences because Swedish IPOs tend to have much better performance than other Nordic IPOs while Denmark has the worst overall performance. At a first glance, one possible explanation for this could be that Swedish stock markets are just generally achieving higher returns than their counterparts in other Nordic countries, but comparison against local index OMXS30 reveals that Swedish IPOs truly have a positive average and median BHARs. The results of the univariate tests suggest that multiple lead underwriters truly improve the performance of Nordic IPOs since while SLUs have negative mean and median BHARs, MLUs tend to outperform their benchmark index. Since differences for mean and median are statistically significant at 5% and 1% levels, these findings give support to the second hypothesis of this paper which suggests that the number of lead underwriters has a positive impact on the long-term performance of Nordic IPOs.

The results of the regression models using the full sample suggest that the size of the lead underwriter syndicate does not have a statistically significant impact on the short-term performance of Nordic IPOs and hence does not give support to the first hypothesis of this study. However, just like univariate tests, models analysing BHAR indicate that there is a positive relationship between the number of lead underwriters and long-term performance and thus gives more support to the second hypothesis. Therefore, the results about MLUs and IPO long-term performance are otherwise in line with the findings of Vithanage et al. (2016) and their certification hypothesis, but this study does not find

a similar non-linear relationship between BHAR and number of lead underwriters. This suggests that in Nordic countries large syndicates do not suffer from a similar moral hazard problem where underwriters have an incentive to free-ride on one another during the pricing process, which would decrease the long-term performance after the size of the syndicate exceeds the optimal point.

In conclusion, the results of this study suggest that the recent change in the structure of the lead underwriter syndicate has had an impact on the performance of Nordic IPOs but unlike in the U.S., this has mainly affected the long-term performance and not so much the underpricing phenomenon. These findings support the second hypothesis but due to mixed results between univariate tests and regression models, this paper does not find robust evidence to support the first hypothesis. Therefore, the main results of this paper are only partially in line with the certification hypothesis of Vithanage et al. (2016) which suggests that additional lead underwriters provide more certification to the offerings they manage and hence MLU IPOs are priced closer to their true value which leads to lower underpricing and better long-term performance.

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Appendices

Appendix 1.) Underwriter reputation.

Underwriter	Number of IPOs rank	Gross proceeds rank	Average rank
Carnegie	10,0	10,0	10,0
SEB	10,0	10,0	10,0
Morgan Stanley & CO International plc	10,0	10,0	10,0
UBS	9,0	10,0	9,5
ABG Sundal Collier	10,0	10,0	10,0
Nordea/Merita	10,0	10,0	10,0
Goldman Sachs International	9,0	10,0	9,5
DnB Markets AS	9,0	9,0	9,0
Handelsbanken Capital Markets	10,0	9,0	9,5
Danske Bank	9,0	9,0	9,0
Pareto Securities Investment AB	10,0	9,0	9,5
Merril Lynch International Ltd / Bank of America Merril Lynch	8,0	9,0	8,5
JP Morgan & Co inc	7,0	9,0	8,0
Lehman Brothers	7,0	8,0	7,5
Citigroup Investment AB / Citi	8,0	8,0	8,0
Alfred Berg	9,0	8,0	8,5
Christiania Bank og Kreditkasse	6,0	8,0	7,0
Swedbank	8,0	8,0	8,0
Deutsche Bank AG	8,0	8,0	8,0
Credit Suisse	7,0	8,0	7,5
First Securities AS	9,0	7,0	8,0
Keefe Bruyette & Woods Inc	3,0	7,0	5,0
Barclays PLC	3,0	7,0	5,0
Mandatum & Co Oy	7,0	7,0	7,0
ArosMaizels / Aros Securities	8,0	7,0	7,5
Arctic Securities ASA	8,0	7,0	7,5
Evli	8,0	6,0	7,0
ABN Amro Rotschild	6,0	6,0	6,0
First Boston Ltd International	3,0	6,0	4,5
Jefferies International Ltd	6,0	6,0	6,0
Gudme Raaschou Securities	6,0	6,0	6,0
BNP Paribas SA	3,0	6,0	4,5
Formuepleje A/S	3,0	6,0	4,5
Eik Bank Danmark A/S	6,0	5,0	5,5
Spar Nord Holding A/S	3,0	5,0	4,0
Robert fleming	7,0	5,0	6,0
ING	3,0	5,0	4,0
OKOBANK Group	3,0	5,0	4,0
CIBC World markets PLC	3,0	5,0	4,0
Karl Johan Fonds AS	3,0	4,0	3,5
UB Securities Ltd	3,0	4,0	3,5
Abu Dhabi Investment Co	3,0	4,0	3,5
Fleming Aros	3,0	4,0	3,5
Fortis Bank Nederland NV	3,0	4,0	3,5
P/F Foroya Banki	3,0	4,0	3,5
Hagstromer & Qviberg AB	6,0	4,0	5,0
Fondsfinans AS	3,0	3,0	3,0
Conventum Oy	3,0	3,0	3,0
eQ Securities	3,0	3,0	3,0
Pohjola Pankki Oyj	3,0	3,0	3,0
Avanza Bank	3,0	3,0	3,0
EPO.Com Online Investment Bank	3,0	3,0	3,0
Opstock Oy	3,0	2,0	2,5
Credit Lyonnais SA	3,0	2,0	2,5
Orion Securities	6,0	2,0	4,0
Fearnley Fonds PLC	7,0	2,0	4,5
FleetBoston Robertson Stephens Inc	3,0	2,0	2,5
Skandinaviska Enskilda Banken AB	3,0	2,0	2,5
Terrain securities	3,0	2,0	2,5
Alexander Corporate Finance Oy	3,0	1,0	2,0
Lage Jonason	3,0	1,0	2,0
Terra Markets AS	3,0	1,0	2,0
Nordnet AB	3,0	1,0	2,0
Chase H&Q	3,0	1,0	2,0
FIM Corporate Finance Oy	3,0	1,0	2,0

Appendix 2. Initial return in Sweden.

	Initial return					
Sweden	(1)	(2)	(3)	(4)	(5)	(6)
MLU dummy	-0,026	-0,021	-	-	-	-
	-(0,62)	-(0,52)	-	-	-	-
Number of lead underwriters	-	-	-0,005	-0,002	-0,065	-0,055
	-	-	-(0,36)	-(0,15)	-(0,90)	-(0,79)
Number of lead underwriters^2	-	-	-	-	0,012	0,011
	-	-	-	-	(0,96)	(0,87)
Underwriter reputation	0,016	0,021	0,016	0,021	0,016	0,021
	(1,18)	(1,53)	(1,19)	(1,54)	(1,17)	(1,53)
Log (gross proceeds)	0,014	0,017	0,010	0,014	0,014	0,017
	(1,00)	(1,21)	(0,85)	(1,04)	(1,04)	(1,16)
Log (age +1)	**0,019***	**0,019***	**0,02***	**0,020***	0,018	**0,019***
	(1,74)	(1,78)	(1,90)	(1,95)	(1,64)	(1,68)
Return 90 days before	**0,537*****	**0,529*****	**0,535*****	**0,528*****	**0,541*****	**0,533*****
	(3,16)	(3,09)	(3,13)	(3,08)	(3,13)	(3,08)
Dot-com bubble	-0,005	0,007	-0,001	0,010	-0,005	0,008
	-(0,11)	(0,17)	-(0,03)	(0,24)	-(0,12)	(0,19)
Technology	**0,101***	**0,102***	**0,100***	**0,101***	**0,101***	0,101
	(1,70)	(1,70)	(1,71)	(1,70)	(1,70)	(1,69)
VC-backed dummy	-	0,028	-	0,024	-	0,032
	-	(0,65)	-	(0,52)	-	(0,72)
Constant	-0,193	**-0,265***	-0,188	**-0,264***	-0,138	**-0,216***
	-(1,43)	-(1,98)	-(1,39)	-(1,95)	-(1,05)	-(1,69)
R-sq	0,25	0,28	0,25	0,28	0,26	0,28
Adj. R-sq	0,19	0,21	0,19	0,21	0,19	0,20
N	97	94	97	94	97	94

Appendix 3. Initial return in Norway.

	Initial return					
Norway	(1)	(2)	(3)	(4)	(5)	(6)
MLU dummy	**-0,062***	-0,053	-	-	-	-
	-(1,81)	-(1,47)	-	-	-	-
Number of lead underwriters	-	-	**-0,031****	**-0,030***	-0,039	-0,033
	-	-	-(2,02)	-(1,82)	-(0,88)	-(0,69)
Number of lead underwriters^2	-	-	-	-	0,001	0,000
	-	-	-	-	(0,18)	(0,05)
Underwriter reputation	0,016	0,016	0,012	0,012	0,012	0,012
	(1,32)	(1,23)	(0,97)	(0,94)	(0,99)	(0,94)
Log (gross proceeds)	-0,003	-0,003	0,003	0,003	0,003	0,003
	-(0,27)	-(0,31)	(0,33)	(0,32)	(0,34)	(0,32)
Log (age +1)	-0,003	-0,007	-0,003	-0,006	-0,003	-0,006
	-(0,35)	-(0,79)	-(0,34)	-(0,71)	-(0,35)	-(0,70)
Return 90 days before	**0,325***	0,309	**0,298***	0,274	**0,296***	0,273
	(1,90)	(1,62)	(1,74)	(1,45)	(1,75)	(1,46)
Dot-com bubble	0,074	0,069	0,060	0,051	0,060	0,051
	(1,07)	(1,06)	(0,81)	(0,75)	(0,82)	(0,75)
Technology	0,012	0,026	0,005	0,027	0,006	0,028
	(0,28)	(0,50)	(0,12)	(0,53)	(0,13)	(0,52)
VC-backed dummy	-	-0,028	-	-0,039	-	-0,039
	-	-(0,84)	-	-(1,18)	-	-(1,20)
Constant	-0,070	-0,061	-0,038	-0,029	-0,030	-0,027
	-(0,63)	-(0,50)	-(0,34)	-(0,24)	-(0,25)	-(0,20)
R-sq	0,19	0,19	0,20	0,21	0,20	0,21
Adj. R-sq	0,13	0,10	0,14	0,13	0,13	0,12
N	99	89	99	89	99	89

Appendix 4. Initial return in Denmark.

	Initial return					
Denmark	(1)	(2)	(3)	(4)	(5)	(6)
MLU dummy	-0,098	-0,097	-	-	-	-
	-(0,76)	-(0,72)	-	-	-	-
Number of lead underwriters	-	-	-0,070	-0,070	-0,026	-0,025
	-	-	-(1,09)	-(1,05)	-(0,18)	-(0,16)
Number of lead underwriters^2	-	-	-	-	-0,008	-0,008
	-	-	-	-	-(0,35)	-(0,35)
Underwriter reputation	-0,077	-0,076	-0,078	-0,078	-0,079	-0,078
	-(1,03)	-(0,96)	-(1,04)	-(0,98)	-(1,04)	-(0,97)
Log (gross proceeds)	0,029	0,028	0,048	0,048	0,049	0,048
	(0,97)	(0,80)	(1,34)	(1,14)	(1,34)	(1,12)
Log (age +1)	0,059	0,059	0,067	0,067	0,069	0,068
	(1,02)	(0,94)	(1,07)	(0,99)	(1,08)	(0,99)
Return 90 days before	0,359	0,364	0,403	0,405	0,389	0,394
	(0,63)	(0,64)	(0,71)	(0,73)	(0,67)	(0,70)
Dot-com bubble	-0,029	-0,031	-0,049	-0,050	-0,056	-0,059
	-(0,35)	-(0,33)	-(0,60)	-(0,54)	-(0,71)	-(0,66)
Technology	-0,138	-0,138	-0,151	-0,151	-0,148	-0,147
	-(1,13)	-(1,10)	-(1,27)	-(1,25)	-(1,21)	-(1,18)
VC-backed dummy	-	-0,006	-	-0,003	-	-0,008
	-	-(0,06)	-	-(0,03)	-	-(0,07)
Constant	0,553	0,553	0,551	0,551	0,512	0,511
	(0,94)	(0,93)	(0,93)	(0,92)	(0,80)	(0,78)
R-sq	0,23	0,23	0,25	0,25	0,25	0,25
Adj. R-sq	0,02	-0,02	0,05	0,01	0,01	-0,03
N	34	34	34	34	34	34

Appendix 5. Initial return in Finland.

	Initial return		
Finland	(1)	(2)	(3)
MLU dummy	0,140	-	-
	(0,54)	-	-
Number of lead underwriters	-	0,139	0,197
	-	(0,82)	(0,33)
Number of lead underwriters^2	-	-	-0,013
	-	-	-(0,11)
Underwriter reputation	-0,077	-0,068	-0,068
	-(1,36)	-(1,38)	-(1,36)
Log (gross proceeds)	0,128	0,109	0,108
	(1,25)	(1,07)	(1,05)
Log (age +1)	-0,062	-0,065	-0,067
	-(0,58)	-(0,64)	-(0,62)
Return 90 days before	**1,791***	**1,84****	**1,849****
	(2,01)	(2,10)	(2,07)
Dot-com bubble	**0,288***	**0,286***	0,283
	(1,76)	(1,71)	(1,69)
Technology	0,334	0,323	0,321
	(1,57)	(1,56)	(1,55)
Constant	0,008	-0,123	-0,163
	(0,02)	-(0,33)	-(0,32)
R-sq	0,47	0,48	0,48
Adj. R-sq	0,34	0,35	0,33
N	37	37	37

Appendix 6. Long-term performance in Finland.

	BHAR36 MSCI RI			BHAR36 OMXH RI		
Finland	(1)	(2)	(3)	(4)	(5)	(6)
MLU dummy	-0,258	-	-	-0,270	-	-
	-(1,16)	-	-	-(1,23)	-	-
Underwriter reputation	-0,047	-0,057	-0,057	-0,039	-0,052	-0,052
	-(0,76)	-(0,89)	-(0,87)	-(0,71)	-(0,94)	-(0,92)
Number of lead underwriters	-	**-0,217**	-0,036	-	**-0,250****	-0,070
	-	-(1,84)	-(0,08)	-	-(2,05)	-(0,13)
Number of lead underwriters^2	-	-	-0,042	-	-	-0,042
	-	-	-(0,44)	-	-	-(0,37)
Initial return	0,000	0,000	0,000	0,000	0,000	0,000
	-(0,34)	-(0,12)	-(0,08)	-(0,46)	-(0,25)	-(0,20)
Log (gross proceeds)	0,082	0,103	0,104	0,028	0,056	0,056
	(0,98)	(1,22)	(1,21)	(0,40)	(0,77)	(0,77)
Dot-com bubble	-0,100	-0,103	-0,115	-0,094	-0,094	-0,105
	-(0,56)	-(0,59)	-(0,64)	-(0,55)	-(0,57)	-(0,62)
Technology dummy	**-0,469****	**-0,476****	**-0,481****	**-0,307***	**-0,312***	**-0,318***
	-(2,67)	-(2,75)	-(2,70)	-(1,79)	-(1,85)	-(1,83)
Log (age +1)	0,134	0,134	0,128	0,054	0,058	0,052
	(1,37)	(1,39)	(1,30)	(0,52)	(0,56)	(0,50)
Constant	-0,133	0,093	-0,032	0,223	0,474	0,348
	-(0,27)	(0,17)	-(0,05)	(0,48)	(0,93)	(0,51)
R-sq	0,37	0,39	0,39	0,20	0,25	0,25
Adj. R-sq	0,21	0,24	0,22	0,01	0,07	0,04
N	37	37	37	37	37	37

Appendix 7. Long-term performance in Sweden.

	BHAR36 MSCI RI						BHAR36 OMXS30 PI					
Sweden	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
MLU dummy	0,234	**0,359***	-	-	-	-	0,167	**0,271***	-	-	-	-
	(1,16)	(1,89)	-	-	-	-	(0,98)	(1,71)	-	-	-	-
Underwriter reputation	-0,068	-0,003	-0,067	-0,006	-0,066	-0,001	-0,066	-0,004	-0,064	-0,006	-0,063	-0,003
	-(0,96)	-(0,07)	-(0,96)	-(0,17)	-(0,92)	-(0,03)	-(1,00)	-(0,13)	-(0,98)	-(0,20)	-(0,96)	-(0,09)
Number of lead underwriters	-	-	**0,163***	**0,169***	0,299	**0,573***	-	-	**0,130***	**0,137***	0,205	0,433
	-	-	(1,79)	(1,84)	(0,81)	(1,71)	-	-	(1,76)	(1,86)	(0,67)	(1,54)
Number of lead underwriters^2	-	-	-	-	-0,027	-0,082	-	-	-	-	-0,015	-0,060
	-	-	-	-	-(0,40)	-(1,31)	-	-	-	-	-(0,27)	-(1,15)
Initial return	**0,010***	**0,007***	**0,010***	**0,007***	**0,010***	**0,007***	**0,009***	0,006	**0,009***	0,006	**0,009***	0,006
	(1,92)	(1,78)	(1,92)	(1,73)	(1,93)	(1,78)	(1,69)	(1,51)	(1,70)	(1,48)	(1,70)	(1,51)
Log (gross proceeds)	**-0,140***	-0,107	**-0,157****	-0,101	**-0,166****	-0,124	-0,114	-0,081	**-0,133***	-0,081	**-0,137***	-0,097
	-(1,75)	-(1,36)	-(2,06)	-(1,33)	-(2,06)	-(1,55)	-(1,60)	-(1,16)	-(1,90)	-(1,19)	-(1,89)	-(1,36)
Dot-com bubble	0,202	0,206	0,217	0,213	0,224	0,224	0,257	0,281	0,273	0,291	0,277	0,299
	(0,62)	(0,65)	(0,67)	(0,67)	(0,68)	(0,70)	(0,86)	(0,97)	(0,92)	(1,00)	(0,92)	(1,02)
Technology dummy	**-0,731****	**-0,546***	**-0,736****	**-0,556***	**-0,740****	**-0,557***	**-0,700****	**-0,546***	**-0,705****	**-0,555***	**-0,708****	**-0,556***
	-(2,25)	-(1,71)	-(2,28)	-(1,75)	-(2,26)	-(1,73)	-(2,37)	-(1,88)	-(2,38)	-(1,91)	-(2,38)	-(1,89)
Log (age +1)	**0,205****	**0,241*****	**0,200****	**0,229*****	**0,203****	**0,241*****	**0,185****	**0,214*****	**0,181****	**0,205****	**0,183****	**0,214*****
	(2,37)	(2,85)	(2,35)	(2,72)	(2,35)	(2,85)	(2,33)	(2,72)	(2,33)	(2,63)	(2,31)	(2,71)
VC-backed dummy	-	**-0,671*****	-	**-0,565*****	-	**-0,633*****	-	**-0,481*****	-	**-0,400****	-	**-0,450*****
	-	-(4,48)	-	-(3,30)	-	-(3,81)	-	-(3,13)	-	-(2,45)	-	-(2,74)
Constant	0,832	-0,063	0,735	-0,154	0,621	-0,512	0,779	-0,059	0,704	-0,132	0,641	-0,394
	(1,02)	-(0,16)	(0,90)	-(0,44)	(0,70)	-(1,29)	(1,02)	-(0,18)	(0,92)	-(0,45)	(0,76)	-(1,10)
R-sq	0,20	0,25	0,21	0,24	0,21	0,25	0,21	0,24	0,21	0,24	0,21	0,24
Adj. R-sq	0,14	0,17	0,15	0,17	0,14	0,17	0,14	0,16	0,15	0,16	0,14	0,16
N	97	94	97	94	97	94	97	94	97	94	97	94

Appendix 8. Long-term performance in Norway.

	BHAR36 MSCI RI						BHAR36 OBX RI					
Norway	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
MLU dummy	**0,489****	**0,460***	-	-	-	-	**0,434****	**0,412***	-	-	-	-
	(2,27)	(1,90)	-	-	-	-	(2,02)	(1,71)	-	-	-	-
Underwriter reputation	-0,006	0,016	0,020	0,041	0,016	0,035	-0,013	0,008	0,010	0,030	0,008	0,028
	-(0,09)	(0,24)	(0,30)	(0,59)	(0,24)	(0,52)	-(0,21)	(0,12)	(0,15)	(0,44)	(0,12)	(0,40)
Number of lead underwriters	-	-	**0,148***	0,112	0,309	0,281	-	-	0,138	0,110	0,209	0,205
	-	-	(1,81)	(0,22)	(1,10)	(0,86)	-	-	(1,66)	(1,19)	(0,74)	(0,62)
Number of lead underwriters^2	-	-	-	-	-0,026	-0,027	-	-	-	-	-0,011	-0,015
	-	-	-	-	-(0,61)	-(0,55)	-	-	-	-	-(0,27)	-(0,31)
Initial return	**0,013***	**0,014***	0,012	0,014	**0,013***	0,014	**0,013***	**0,014***	**0,012***	0,013	**0,012***	0,013
	(1,90)	(1,85)	(1,63)	(1,58)	(1,68)	(1,62)	(1,97)	(1,85)	(1,74)	(1,62)	(1,76)	(1,64)
Log (gross proceeds)	-0,063	-0,062	-0,083	-0,074	-0,086	-0,078	-0,063	-0,060	-0,083	-0,073	-0,085	-0,075
	-(0,75)	-(0,71)	-(0,95)	-(0,82)	-(0,96)	-(0,83)	-(0,74)	-(0,68)	-(0,93)	-(0,80)	-(0,92)	-(0,79)
Dot-com bubble	-0,306	**-0,497***	-0,267	-0,466	-0,257	-0,458	-0,222	**-0,415***	-0,183	-0,380	-0,178	-0,375
	-(1,17)	-(1,93)	-(0,95)	-(1,59)	-(0,93)	-(1,59)	-(0,98)	-(1,83)	-(0,75)	-(1,46)	-(0,73)	-(1,46)
Technology dummy	-0,006	0,271	0,073	0,327	0,058	0,313	-0,127	0,152	-0,058	0,198	-0,065	0,190
	-(0,02)	(0,93)	(0,24)	(1,07)	(0,19)	(1,01)	-(0,42)	(0,52)	-(0,19)	(0,65)	-(0,21)	(0,61)
Log (age +1)	**0,198***	**0,224***	**0,204***	**0,233***	**0,204***	**0,233***	**0,202***	**0,224***	**0,206***	**0,231***	**0,207***	**0,231***
	(1,83)	(1,85)	(1,81)	(1,83)	(1,80)	(1,83)	(1,84)	(1,83)	(1,82)	(1,80)	(1,81)	(1,80)
VC-backed dummy	-	**-0,540****	-	**-0,499***	-	**-0,505****	-	**-0,547****	-	**-0,507***	-	**-0,510***
	-	-(2,33)	-	-(1,99)	-	-(1,99)	-	-(2,28)	-	-(1,96)	-	-(1,95)
Constant	-0,403	-0,541	-0,506	-0,629	-0,657	-0,774	-0,414	-0,552	-0,515	-0,640	-0,581	-0,722
	-(0,79)	-(0,98)	-(0,95)	-(1,09)	-(1,11)	-(1,22)	-(0,82)	-(1,00)	-(0,97)	-(1,12)	-(0,98)	-(1,14)
R-sq	0,12	0,15	0,10	0,13	0,10	0,13	0,11	0,14	0,10	0,12	0,10	0,12
Adj. R-sq	0,05	0,06	0,03	0,04	0,02	0,03	0,04	0,05	0,03	0,04	0,02	0,03
N	99	89	99	89	99	89	99	89	99	89	99	89

Appendix 9. Long-term performance in Denmark.

	BHAR36 MSCI RI						BHAR36 OMXCAP RI					
Denmark	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
MLU dummy	0,229	0,240	-	-	-	-	0,279	0,275	-	-	-	-
	(0,72)	(0,78)	-	-	-	-	(0,94)	(0,95)	-	-	-	-
Underwriter reputation	-0,026	-0,019	-0,014	-0,003	-0,010	-0,001	-0,036	-0,039	-0,022	-0,021	-0,018	-0,019
	-(0,34)	-(0,22)	-(0,21)	-(0,04)	-(0,14)	-(0,01)	-(0,44)	-(0,42)	-(0,30)	-(0,25)	-(0,23)	-(0,21)
Number of lead underwriters	-	-	0,218	0,224	0,056	0,078	-	-	**0,255***	**0,255***	0,085	0,083
	-	-	(1,47)	(0,13)	(0,08)	(0,12)	-	-	(1,72)	(1,77)	(0,14)	(0,13)
Number of lead underwriters^2	-	-	-	-	0,030	0,027	-	-	-	-	0,031	0,032
	-	-	-	-	(0,29)	(0,26)	-	-	-	-	(0,32)	(0,32)
Initial return	-0,002	-0,002	-0,001	-0,001	-0,001	-0,001	-0,001	-0,001	0,000	0,000	0,000	0,000
	-(1,04)	-(0,98)	-(0,50)	-(0,46)	-(0,47)	-(0,43)	-(0,62)	-(0,61)	-(0,05)	-(0,05)	-(0,01)	-(0,01)
Log (gross proceeds)	0,084	0,075	0,003	-0,011	0,000	-0,012	0,037	0,041	-0,056	-0,057	-0,060	-0,058
	(0,65)	(0,59)	(0,02)	-(0,08)	(0,00)	-(0,09)	(0,29)	(0,33)	-(0,41)	-(0,43)	-(0,46)	-(0,45)
Dot-com bubble	0,349	0,325	0,407	0,375	0,436	0,405	0,240	0,250	0,308	0,307	0,339	0,342
	(0,61)	(0,54)	(0,70)	(0,60)	(0,81)	(0,71)	(0,44)	(0,43)	(0,56)	(0,52)	(0,66)	(0,63)
Technology dummy	0,083	0,082	0,148	0,147	0,133	0,133	0,058	0,059	0,133	0,133	0,116	0,116
	(0,18)	(0,18)	(0,34)	(0,33)	(0,32)	(0,31)	(0,13)	(0,13)	(0,31)	(0,30)	(0,28)	(0,27)
Log (age +1)	0,076	0,070	0,050	0,041	0,044	0,036	0,081	0,084	0,050	0,050	0,044	0,045
	(0,58)	(0,50)	(0,47)	(0,36)	(0,37)	(0,29)	(0,53)	(0,52)	(0,42)	(0,40)	(0,35)	(0,34)
VC-backed dummy	-	-0,094	-	-0,133	-	-0,117	-	0,039	-	-0,005	-	0,014
	-	-(0,25)	-	-(0,36)	-	-(0,33)	-	(0,10)	-	-(0,01)	-	(0,04)
Constant	-0,646	-0,635	-0,668	-0,657	-0,523	-0,529	-0,493	-0,497	-0,523	-0,522	-0,372	-0,371
	-(1,13)	-(1,12)	-(1,31)	-(1,29)	-(0,96)	-(0,94)	-(0,77)	-(0,78)	-(0,89)	-(0,88)	-(0,58)	-(0,57)
R-sq	0,13	0,13	0,17	0,17	0,17	0,17	0,09	0,09	0,14	0,14	0,15	0,15
Adj. R-sq	-0,12	-0,16	-0,06	-0,11	-0,11	-0,15	-0,17	-0,22	-0,10	-0,14	-0,14	-0,19

Appendix 10. Swedish IPOs.

Issuer Name	Country	Year	Number of lead managers	Initial return	BHAR36 MSCI Europe (RI)
Camurus AB	Sweden	2015	2	8 %	25 %
Attendo AB	Sweden	2015	3	40 %	7 %
Dometic Group AB	Sweden	2015	5	15 %	31 %
Bravida Holding AB	Sweden	2015	4	8 %	52 %
CLX Communications AB	Sweden	2015	2	27 %	46 %
Capio AB	Sweden	2015	4	-1 %	-36 %
Pandox AB	Sweden	2015	3	1 %	38 %
Nobina AB	Sweden	2015	3	-6 %	100 %
Alimak Group AB	Sweden	2015	3	8 %	35 %
Coor Service Management Holding AB	Sweden	2015	4	0 %	82 %
Nordax Group AB	Sweden	2015	3	-3 %	25 %
Tobii AB	Sweden	2015	2	40 %	-3 %
Troax Group AB	Sweden	2015	2	20 %	203 %
Hoist Finance AB	Sweden	2015	3	14 %	19 %
Dustin Group AB	Sweden	2015	4	18 %	27 %
Eltel AB	Sweden	2015	3	7 %	-53 %
Thule Group AB	Sweden	2014	3	12 %	139 %
Granges AB	Sweden	2014	4	2 %	102 %
Inwido AB	Sweden	2014	2	-6 %	56 %
Scandi Standard AB	Sweden	2014	2	18 %	26 %
Com Hem Holding AB	Sweden	2014	4	9 %	96 %
Recipharm AB	Sweden	2014	2	9 %	61 %
Hemfosa Fastigheter AB	Sweden	2014	2	4 %	100 %
Bufab AB	Sweden	2014	2	6 %	70 %
Sanitec Oy	Sweden	2013	3	6 %	47 %
Transmode Holding AB	Sweden	2011	3	2 %	79 %
(Bulten) FinnvedenBulten AB	Sweden	2011	2	0 %	40 %
Byggmax Group AB	Sweden	2010	2	6 %	-62 %
Duni AB	Sweden	2007	2	2 %	65 %
East Capital Explorer AB	Sweden	2007	3	1 %	-2 %
Systemair AB	Sweden	2007	2	0 %	35 %
Tilgin AB	Sweden	2006	2	-12 %	-73 %
Lindab International AB	Sweden	2006	2	3 %	-14 %
Rezidor Hotel Group	Sweden	2006	3	0 %	-41 %
KappAhl AB	Sweden	2006	2	5 %	0 %
Orexo AB	Sweden	2005	2	0 %	-65 %
TradeDoubler AB	Sweden	2005	2	0 %	-56 %
Indutrade AB	Sweden	2005	2	13 %	56 %
Oriflame Cosmetics SA	Sweden	2004	2	10 %	-38 %
Nobia AB	Sweden	2002	2	-8 %	26 %
Intrum Justitia AB	Sweden	2002	2	6 %	-32 %
Alfa Laval AB	Sweden	2002	3	9 %	-11 %
D Carnegie & Co AB	Sweden	2001	2	15 %	-19 %
Dimension AB	Sweden	2001	2	8 %	-97 %
Eniro AB	Sweden	2000	3	0 %	12 %
Telia AB	Sweden	2000	2	4 %	-36 %
Mind AB	Sweden	2000	2	2 %	-74 %
Tele1 Europe Holding AB	Sweden	2000	2	29 %	-58 %
Proffice AB	Sweden	1999	2	32 %	16 %
Kungsleden International	Sweden	1999	2	0 %	163 %
HiQ International AB	Sweden	1999	2	-6 %	104 %
Boule Diagnostics AB	Sweden	2011	n.a.	-4 %	-27 %
Moberg Derma AB	Sweden	2011	n.a.	-1 %	-28 %
Senzime AB	Sweden	2008	n.a.	15 %	-8 %
Dios Fastigheter AB	Sweden	2006	n.a.	-8 %	12 %
Collector AB	Sweden	2015	1	16 %	-6 %
NP3 Fastigheter AB	Sweden	2014	1	14 %	49 %
Lifco AB	Sweden	2014	1	31 %	113 %
Bactiguard Holding AB	Sweden	2014	1	-18 %	-38 %
Besqab AB	Sweden	2014	1	16 %	144 %
Platzer Fastigheter AB	Sweden	2013	1	5 %	106 %
Karolinska Development AB	Sweden	2011	1	1 %	-58 %
MQ Holding AB	Sweden	2010	1	-1 %	-85 %
Arise Windpower AB	Sweden	2010	1	-2 %	-71 %
(GHP) Global Health Partner AB	Sweden	2008	1	2 %	-26 %
HMS Industrial Networks AB	Sweden	2007	1	-1 %	55 %
Nederman Holding AB	Sweden	2007	1	10 %	19 %
BE Group AB	Sweden	2006	1	6 %	-9 %
Biovitrum AB	Sweden	2006	1	14 %	-31 %
Gant Co AB	Sweden	2006	1	37 %	46 %
Hakon Invest AB (ICA)	Sweden	2005	1	6 %	39 %
Hemtex AB	Sweden	2005	1	19 %	-64 %
Ainax AB	Sweden	2004	1	0 %	1 %
NOTE AB	Sweden	2004	1	-10 %	-51 %
Unibet Group PLC	Sweden	2004	1	28 %	350 %
Ballingslov International AB	Sweden	2002	1	0 %	94 %
Vitrolife AB	Sweden	2001	1	-10 %	-43 %
RNB Retail & Brands AB	Sweden	2001	1	-24 %	8 %
Bioinvent International AB	Sweden	2001	1	-17 %	-92 %
BTS Group AB	Sweden	2001	1	1 %	-10 %
NeoNet AB	Sweden	2000	1	-16 %	-32 %
Orc Software AB	Sweden	2000	1	19 %	-20 %
AudioDev AB	Sweden	2000	1	3 %	-29 %
Jobline International AB	Sweden	2000	1	-9 %	-32 %
Pyrosequencing AB	Sweden	2000	1	1 %	-61 %
AU-System AB	Sweden	2000	1	15 %	-56 %
Axis Communications AB	Sweden	2000	1	-2 %	-37 %
Scandinavia Online AB	Sweden	2000	1	7 %	-66 %
JC	Sweden	2000	1	-9 %	6 %
Mekonomen AB	Sweden	2000	1	3 %	123 %
Micronic Laser Systems AB (NOW 59575N)	Sweden	2000	1	95 %	-39 %
Q-Med AB	Sweden	1999	1	2 %	46 %
M2S Sverige AB	Sweden	1999	1	16 %	-72 %
Enlight Interactive AB	Sweden	1999	1	-4 %	-69 %
Clas Ohlson AB	Sweden	1999	1	24 %	499 %
Connecta AB	Sweden	1999	1	108 %	18 %
Novotek AB	Sweden	1999	1	28 %	-26 %
RKS AB	Sweden	1999	1	5 %	-44 %
Teligent AB	Sweden	1999	1	0 %	40 %
Telelogic AB	Sweden	1999	1	27 %	153 %
Jeeves Information Systems AB	Sweden	1999	1	-3 %	-61 %

Appendix 11. Norwegian IPOs.

Issuer Name	Country	Year	Number of lead managers	Initial return	BHAR36 MSCI Europe (RI)
(sbanken) Skandiabanken ASA	Norway	2015	2	-5 %	85 %
Kid ASA	Norway	2015	2	-3 %	20 %
Europris ASA	Norway	2015	4	-5 %	-44 %
Multiconsult AS	Norway	2015	2	18 %	-45 %
RenoNorden AS	Norway	2014	3	-4 %	-119 %
RAK Petroleum PLC	Norway	2014	2	31 %	-67 %
Entra ASA	Norway	2014	3	3 %	63 %
XXL ASA	Norway	2014	4	5 %	9 %
Scatec Solar ASA	Norway	2014	2	-1 %	137 %
Havyard Group AS	Norway	2014	2	-2 %	-32 %
Zalaris ASA	Norway	2014	2	6 %	83 %
cXense AS	Norway	2014	2	-3 %	-31 %
(Insr) Vardia Insurance Group ASA	Norway	2014	2	-15 %	-79 %
Tanker Investments Ltd	Norway	2014	3	-1 %	-37 %
Napatech A/S	Norway	2013	2	-1 %	42 %
BW LPG Ltd	Norway	2013	3	5 %	-16 %
Odfjell Drilling AS	Norway	2013	3	-3 %	-84 %
Ocean Yield AS	Norway	2013	6	-1 %	131 %
Asetek A/S	Norway	2013	2	-3 %	-49 %
Borregaard ASA	Norway	2012	2	-1 %	169 %
Selvaag Bolig ASA	Norway	2012	3	-4 %	0 %
Hoegh LNG Holdings Ltd	Norway	2011	3	-9 %	23 %
Sevan Drilling ASA	Norway	2011	6	-33 %	-70 %
Norway Royal Salmon ASA	Norway	2011	2	4 %	39 %
Gjensidige Forsikring ASA	Norway	2010	5	0 %	99 %
Floatel International Ltd	Norway	2010	2	-6 %	49 %
Statoil Fuel & Retail ASA	Norway	2010	4	4 %	47 %
Morpol ASA	Norway	2010	3	-10 %	-90 %
Oppstartsfase I ASA	Norway	2010	6	-7 %	99 %
Solvtrans Holding ASA	Norway	2010	2	1 %	-37 %
P/F Bakkafrost	Norway	2010	3	11 %	95 %
Flex LNG Ltd	Norway	2009	3	2 %	-53 %
Polarcus DMCC	Norway	2009	3	-7 %	29 %
Pronova BioPharma ASA	Norway	2007	2	4 %	-16 %
Dockwise Ltd	Norway	2007	2	1 %	-35 %
Grieg Seafood ASA	Norway	2007	2	4 %	7 %
Protector Forsikring ASA	Norway	2007	2	8 %	3 %
ElectroMagnetic GeoService AS	Norway	2007	3	8 %	-70 %
Algeta ASA	Norway	2007	2	-6 %	52 %
AKVA Group ASA	Norway	2006	2	1 %	-19 %
Eitzen Chemical ASA	Norway	2006	2	3 %	-80 %
Marine Farms ASA	Norway	2006	2	-1 %	18 %
TrollTech ASA	Norway	2006	2	9 %	-36 %
Ability Group ASA	Norway	2006	2	0 %	-59 %
Petrojarl ASA	Norway	2006	2	-5 %	31 %
BW Offshore Limited	Norway	2006	2	0 %	-45 %
Renewable Energy Corp ASA	Norway	2006	2	28 %	-9 %
Scorpion Offshore Ltd	Norway	2005	2	0 %	-31 %
Funcom A/S	Norway	2005	2	-10 %	-58 %
ODIM ASA	Norway	2005	2	5 %	565 %
Norgani Hotels ASA	Norway	2005	2	-1 %	17 %
Biotec Pharmacon ASA	Norway	2005	2	2 %	-61 %
(BW Gas) Bergesen Worlwide Gas ASA	Norway	2005	4	-6 %	-77 %
Pertra ASA	Norway	2006	1	8 %	n.a.
Cermaq ASA	Norway	2005	2	0 %	-4 %
Deep Sea Supply ASA	Norway	2005	3	4 %	71 %
Artumas Group Inc	Norway	2005	2	-6 %	-72 %
Eidesvik Offshore ASA	Norway	2005	2	11 %	-68 %
Revus Energy ASA	Norway	2005	2	5 %	38 %
VIA Travel Group AS	Norway	2005	2	-2 %	33 %
Eastern Drilling ASA	Norway	2005	2	8 %	24 %
Allianse ASA	Norway	2005	2	6 %	107 %
(Havfisk) Aker Seafoods ASA	Norway	2005	2	-1 %	-39 %
Awilco ASA	Norway	2005	2	0 %	401 %
Polimoon ASA	Norway	2005	2	-1 %	10 %
(APL) Advanced Production & Loading AS	Norway	2005	2	18 %	117 %
Findexa AS	Norway	2004	3	1 %	19 %
Mamut ASA	Norway	2004	2	-4 %	14 %
Catch Communications ASA	Norway	2004	2	-1 %	14 %
Yara International ASA	Norway	2004	2	24 %	175 %
(otello) Opera Software ASA	Norway	2004	2	14 %	-56 %
Media & Research Group ASA	Norway	2005	1	-5 %	n.a.
Norwegian Air Shuttle ASA	Norway	2003	2	4 %	98 %
Acta Holding ASA	Norway	2001	2	1 %	-73 %
(Equinor) Statoil ASA	Norway	2001	3	0 %	24 %
(Intelecom) Consorte Group ASA	Norway	2001	2	1 %	-31 %
Telenor ASA	Norway	2000	2	-4 %	10 %
Fjord Seafood ASA	Norway	2000	2	9 %	-70 %
(expert)EILAG	Norway	2000	2	-1 %	-15 %
PC-Lan ASA(Merkantildata AS)	Norway	1999	2	-13 %	-47 %
InfoStream ASA	Norway	1999	2	-1 %	94 %
DynaPel Systems Inc	Norway	2005	1	12 %	n.a.
Aker Kvaerner ASA	Norway	2004	2	-3 %	n.a.
Hofseth Biocare ASA	Norway	2011	1	26 %	-78 %
Cellcura ASA	Norway	2010	1	-22 %	-110 %
(infratek) Hafslund Infratek ASA	Norway	2007	1	-2 %	66 %
Cecon ASA	Norway	2007	1	0 %	-62 %
Scan Geophysical AS	Norway	2007	1	-2 %	-57 %
SalMar ASA	Norway	2007	1	0 %	59 %
Nexus Floating Production Ltd	Norway	2007	1	1 %	-74 %
NEAS ASA	Norway	2007	1	-3 %	-3 %
Simtronics ASA	Norway	2007	1	40 %	69 %
Aker Exploration ASA	Norway	2006	1	2 %	-31 %
Spits ASA	Norway	2006	1	1 %	-8 %
Faktor Eiendom ASA	Norway	2006	1	-1 %	-74 %
Codfarmers ASA	Norway	2006	1	6 %	-75 %
(weifa) Clavis Pharma ASA	Norway	2006	1	2 %	-59 %
SeaBird Exploration Ltd	Norway	2006	1	29 %	-46 %
(BWG) Block Watne AS	Norway	2006	1	12 %	-47 %
(autv.holding) Kongsberg Automotive ASA	Norway	2005	1	4 %	-104 %
Norway Energy and Marine Insurance ASA	Norway	2005	1	5 %	79 %
Exploration Resources ASA	Norway	2005	1	19 %	147 %
Domstein AS	Norway	2001	1	-2 %	-79 %
(solon) Nutri Pharma ASA	Norway	2000	1	-1 %	-56 %
StepStone ASA	Norway	2000	1	59 %	-59 %

Appendix 12. Finnish IPOs.

Issuer Name	Country	Year	Number of lead managers	Initial return	BHAR36 MSCI Europe (RI)
Consti Yhtiot Oy	Finland	2015	1	4 %	-43 %
Evli Pankki Oyj	Finland	2015	1	23 %	14 %
Kotipizza Group Oyj	Finland	2015	1	3 %	209 %
Pihlajalinna Oy	Finland	2015	1	10 %	-1 %
Asiakastieto Group Oyj	Finland	2015	1	4 %	55 %
Restamax Oyj	Finland	2013	1	8 %	46 %
SRV Yhtiot Oyj	Finland	2007	1	10 %	3 %
Suomen Terveystalo Oyj	Finland	2007	1	2 %	17 %
Outokumpu Technology Oyj	Finland	2006	2	3 %	85 %
FIM Corporate Finance Oy	Finland	2006	1	6 %	9 %
Ahlstrom Paper Group Oy	Finland	2006	1	12 %	-34 %
Salcomp Oy	Finland	2006	1	0 %	-11 %
Neste Oil Corporation	Finland	2005	4	8 %	-5 %
AffectoGenimap Oyj	Finland	2005	1	0 %	-76 %
Kemira GrowHow OYJ	Finland	2004	2	4 %	55 %
QPR Software Oyj	Finland	2002	1	-31 %	-111 %
SSH Communications Security Oy	Finland	2000	2	-4 %	-76 %
Tecnomen Oyj	Finland	2000	2	8 %	-54 %
Vacon Oyj	Finland	2000	1	16 %	45 %
Beltton Yhtiot Oyj	Finland	2000	1	-1 %	66 %
Biotie Therapies Corp	Finland	2000	1	2 %	-56 %
Okmetic Oyj	Finland	2000	1	-1 %	-35 %
Wecan Electronics Oyj	Finland	2000	1	1 %	-26 %
Iocore PLC	Finland	2000	1	15 %	-50 %
Tekla Corporation Oyj	Finland	2000	1	2 %	-35 %
Etteplan Oyj	Finland	2000	1	-2 %	-5 %
Saunalahti Oy	Finland	2000	1	-28 %	-47 %
Satama Interactive Oyj	Finland	2000	1	86 %	-58 %
BasWare Oyj	Finland	2000	1	234 %	-41 %
F-Secure Oyj	Finland	1999	3	253 %	-54 %
Perlos Corp	Finland	1999	2	25 %	-18 %
Eimo Oyj	Finland	1999	3	-5 %	-22 %
Proha Oyj	Finland	1999	n.a.	-20 %	-38 %
Comptel Oyj	Finland	1999	1	181 %	-58 %
Tieto-X Oy	Finland	1999	n.a.	-3 %	-33 %
SysOpen Oyj	Finland	1999	n.a.	56 %	-43 %
TH Tiedonhallinta Oy	Finland	1999	n.a.	-1 %	-61 %
Aldata Solution Oyj	Finland	1999	1	20 %	15 %
Oyj Liinos ABP	Finland	1999	1	7 %	-45 %
Biohit Oyj	Finland	1999	n.a.	10 %	-31 %
Sanitec Corp	Finland	1999	1	16 %	24 %
Stonesoft Oyj	Finland	1999	n.a.	1 %	41 %
Teleste Oyj	Finland	1999	1	3 %	42 %
Marimekko Corp	Finland	1999	n.a.	-14 %	91 %
TJ-Tieto Oy	Finland	1999	n.a.	44 %	-66 %
Janton Oyj	Finland	1999	n.a.	5 %	22 %

Appendix 13. Danish IPOs.

Issuer Name	Country	Year	Number of lead managers	Initial return	BHAR36 MSCI Europe (RI)
NNIT A/S	Denmark	2015	2	24 %	-7 %
OW Bunker A/S	Denmark	2014	3	20 %	-46 %
ISS A/S	Denmark	2014	5	14 %	50 %
Matas A/S.	Denmark	2013	2	3 %	3 %
Zealand Pharma A/S	Denmark	2010	2	-9 %	-53 %
PANDORA A/S	Denmark	2010	4	25 %	-33 %
Chr Hansen Holding A/S	Denmark	2010	5	6 %	86 %
LifeCycle Pharma A/S	Denmark	2006	2	7 %	-62 %
TrygVesta A/S(NOW 86141N)	Denmark	2005	5	11 %	46 %
TopoTarget A/S	Denmark	2005	3	17 %	-113 %
Novozymes A/S	Denmark	2000	2	1 %	68 %
RTX Telecom A/S	Denmark	2000	2	29 %	-37 %
M&E Biotech	Denmark	2000	3	-8 %	-51 %
SimCorp A/S	Denmark	2000	2	0 %	-16 %
H Lundbeck A/S	Denmark	1999	3	13 %	345 %
Danske Andelskassers Bank A/S	Denmark	2011	n.a.	4 %	-74 %
Nordic Tankers A/S	Denmark	2007	1	9 %	n.a.
EuroInvestor.com A/S	Denmark	2007	n.a.	85 %	n.a.
Comendo A/S	Denmark	2006	n.a.	90 %	n.a.
Mondo A/S	Denmark	2006	n.a.	3 %	-78 %
Danionics A/S	Denmark	2001	1	10 %	n.a.
Cimber Sterling Group A/S	Denmark	2009	1	-12 %	-85 %
NunaMinerals A/S	Denmark	2008	1	-5 %	-36 %
Trifork A/S	Denmark	2007	1	-26 %	52 %
Erria A/S	Denmark	2007	1	50 %	-60 %
KlimaInvest A/S	Denmark	2007	1	5 %	-33 %
P/F Foroya Banki	Denmark	2007	1	22 %	3 %
Exiqon AS	Denmark	2007	1	13 %	-55 %
FirstFarms A/S	Denmark	2006	1	-1 %	-32 %
Formuepleje Merkur A/S	Denmark	2006	1	171 %	-44 %
Curalogic AS	Denmark	2006	1	0 %	-17 %
Gudme Raaschou Vision A/S	Denmark	2003	1	-1 %	-62 %
Danware Data A/S	Denmark	2001	1	0 %	-40 %
Thrane & Thrane A/S	Denmark	2001	1	0 %	84 %
Maconomy A/S	Denmark	2000	1	0 %	-69 %
Genmab A/S	Denmark	2000	1	-2 %	-57 %
I-data International AS	Denmark	1999	1	0 %	-68 %
Damgaard A/S	Denmark	1999	1	0 %	-42 %
Navision Software A/S	Denmark	1999	1	2 %	104 %