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Master Degree Project in Finance

IPO Underpricing on Aktietorget & First North
- An empirical study on how Guarantors, Management ownership and
Management commitments affect underpricing

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Abstract

Underpricing is a widely discussed phenomenon in previous literature and refers to abnormal first-day returns on initial public offerings (IPO). An IPO is the first time a stock is offered to the public and is in Sweden often done by smaller companies seeking capital to expand their business. This thesis addresses underpricing on 210 Swedish companies listed on the market places Aktietorget and First North during 2010-2016. Special emphasis is put on guarantors, management ownership and management commitments, using data from prospectus and memorandums released in connection with the IPO. Previous research has, to a wide extent, explained underpricing with asymmetric information theories and has found that management ownership increase underpricing. Sparse research is done on guarantors and management commitments, why comparable research has been used to form hypotheses. We find that guarantors significantly decrease underpricing but also that management ownership and management commitments does not significantly affect underpricing for companies listed on Aktietorget and First North during the researched period.

Keywords: Initial public offerings, Underpricing, Guarantors, Management ownership, Management commitments

Contents

1. Introduction

This thesis addresses the phenomenon of underpricing on initial public offerings (IPO) on the Swedish market places Aktietorget and First North with emphasis on guarantors, management ownership and management commitments. An IPO is the first time a stock is offered to the public and is in Sweden often done by smaller companies seeking capital to expand their business. Adam Kostyál, Vice President NASDAQ OMX, says Sweden was the most active market place for IPO's in Europe during 2016 and find that most of the activity has been concentrated to the market places of interest for this study. In an interview with Svenska Dagbladet, Kostyál says this is due to the positive attitude towards small- and mid-size firms and refers to the difference from other countries in Europe where the companies need to be larger to capture investor interest (Cederblad, 2016). In an IPO, the presence of asymmetric information creates uncertainty about the true value of the firm. This asymmetric information dilemma has generated a wide range of underpricing theories.

Underpricing refers to when the closing price on the first day of trading exceeds the initial offer price. The company is then priced lower than its true value. Ibbotson (1975) find this phenomenon on the U.S. market, Ljungqvist (1997) on the German market and Loughran et al. (1994) find underpricing on 25 markets all over the world, including Sweden. The informational gap between informed and uninformed investors, i.e. the asymmetric information, is commonly considered as one reason behind the phenomenon underpricing. The informational gap creates uncertainty among the uninformed investors who needs compensation to bridge the gap. One can see underpricing as such compensation. By underpricing, the company takes on costs that signal positive beliefs in the future. It also attracts informed investors who in turn will be followed by uninformed investors. The increased demand might lead to rationing of shares, excess liquidity on the market and a triggered price.

Empirical researchers have explained underpricing and the informational gap with different variables. Aggarwal et al. (2002) study the level of management ownership prior the IPO and find that it is positively correlated with underpricing. They explain this by an informational momentum created by the underpricing on the first day of trading that creates analyst coverage and increased interest and demand for the stock. The increased interest lasts until lock-up agreements on management expires and the management can liquidate their wealth increase. In Sweden, and particularly on the smaller lists, commitments and guarantors are two common agreements in connection to the

IPO. To the best of our knowledge, there is no academic research on these two settings, why we aim to shed some light on them. Perhaps the lack of academic research is due to the fact these agreements exist on smaller lists and research focus on larger lists, like OMX Stockholm. Commitments are similar to the more international known cornerstone investor, or anchor investor, where investors agree to purchase shares before they are offered to the public. When investors commit, they are promised allotment for their commitment and they pay the same price for their shares as other investors. Guarantors are investors who agree to purchase shares in case of the issuance does not get fully subscribed. It is a kind of insurance for the issuer that it will be able to raise capital. For this guarantee, the guarantors are paid a commission on the guaranteed capital for the risk they are taking.

The purpose of this thesis is to search for relationships between underpricing and management ownership, management commitments and guarantors on Aktietorget and First North These Swedish lists have not been studied in the context of these topics and the characteristics of the firms going public are interesting. Firms on these lists are usually small, young and expansive. In this stage of the business life cycle, they are also likely to have management ownership and, due to uncertainty about the future, they are also likely to use commitments or guarantors. We will test three hypotheses; 1. Guarantors decrease underpricing, 2. Management ownership increase underpricing, 3. Management commitments increase underpricing.

Our thesis contributes to a better understanding of the phenomenon of underpricing, especially for firms listed on the Swedish lists Aktietorget and First North. The paper focuses on, in this context, unexplored fields of guarantors, management ownership and management commitments and will be helpful for both issuing firms and investors regarding understanding and decision making around the IPO.

We find that guarantors significantly decrease underpricing whereas management ownership and management commitments have no significant effect on underpricing. Furthermore, controlling for the age of the firms, the offer sizes, whether the firms are in the high-tech industry or not, if the firms have dual class shares and in which year they are listed, strengthen the significance of the guarantor variable. However, management ownership and management commitments remain insignificant. The control variables are found significant on underpricing in previous research and we find that the offer size, a dummy whether the company is in the high-tech industry or not and a dummy for dual class shares are significant. The mean underpricing of 12.0 percent is in line with the level of underpricing found in previous research.

The remaining parts of this thesis are structured as follows. Section 2 presents theories on underpricing and asymmetric information and provides a description of important concepts to the study. Section 3 motivates and states the hypotheses. Section 4 describes our data and the methodology used in our regressions. Section 5 contains results and analysis. Section 6 validates our data and checks the robustness of the results. Finally, in section 7 we discuss our findings and suggest future research.

2. Literature review

2.1 Why do companies go public?

There are several reasons why privately held companies go public and how they do it. When a company issues new shares and/or present owners sell already existing shares before the first day of trading the procedure is called IPO. Which of the three options they choose is dependent on the situation of the company, but most common is the situation when the company issues new shares because it needs equity capital (Ritter & Welch, 2002). Ritter & Welch, (2002) also state that an important factor is the possibility for entrepreneurs and other shareholders to sell off some of their shares. Furthermore, Ritter & Welch (2002) support the market timing theory that firms tend to go public when it is good market conditions, with the stage of the firm in its life cycle as the second most important determinant of the IPO decision. This suggests that not only the situation of the company is important when a company decides to go public.

When a company issues equity, much literature focus on the need of capital for a company in an expansion phase. Brau & Fawcett (2006) analyze the motivation for going public through a survey of 336 CFOs in the United States between January 2000 and December 2002. The results of the survey suggest that future acquisitions are the primary motivation, but the dot-com bubble around this time is a shortage of the study. However, in an empirical analysis of the Italian market with a large dataset over eleven years, Pagano et al. (1998) find that IPOs appear to take place after an expansion phase to refinance the companies' balance sheet rather than financing the expansion itself. The sample size of their analysis makes it more generalizable to other industrialized countries.

Rydqvist & Högblom (1995) suggest that owners want to liquidate their investment for consumption or rebalance their portfolios, similar to Ritter & Welch's (2002) arguments. Pagano et al. (1998) contrast and find little evidence

that diversification is a major factor to go public. Ritter & Welch (2002) state that nonfinancial reasons like reputation and credibility play a minor role in the decision to go public. Bancel & Mittoo (2009) find evidence, through a survey with CFOs from 12 different countries, that reputation and credibility is a significant motive for going public. They also empathize financial reasons and, like Ritter & Welch (2002), that one single factor cannot explain the decision to go public. It is a complex decision driven by many factors such as age and size of the firm, ownership structure, market conditions and industry among others.

2.2 IPO underpricing

The underpricing of initial public offerings (IPO) is a widely discussed phenomenon. When an IPO generates first-day returns (having a closing price higher than the initial offer) it is considered underpriced (Ritter, 1998). Underpricing means that the company is taking on indirect costs, selling shares at a discount (Loughran & Ritter 2002). Ibbotson (1975) analyze the American market and find that, on average, newly issued common stocks in the 60's had an average first day return of 11.4 percent. Since Ibbotson, the range of research on this topic has been both profound and wide. Loughran et al. (1994) document IPO underpricing in 25 markets all over the world, including Sweden. Abrahamson et al. (2011) studies the Swedish market places Aktietorget, First North and Nasdaq OMX between 2000-2009 and find underpricing of 6.4 percent for the whole sample of 172 IPOs. The highest underpricing of 8.0 percent is found on Aktietorget, followed by First North with 5.4 percent and they find the lowest underpricing on Nasdaq OMX with 4.5 percent. Others focus on the reason behind this phenomenon, rather than the width of it. Ritter (1998) presents reasons such as ownership dispersion, asymmetric information and signaling. Beatty et al. (1986) argue that the underpricing comes from uncertainty about the ex-IPO performance, while others think it is more of an agency problem (Welch, 2002).

2.3 Asymmetric information

This thesis will mainly focus on asymmetric information theories and especially those who can be related to guarantors, management ownership and management commitments in connection with the IPO. Asymmetric information refers to the setting where one party possesses more information than the rest of the market. This contradicts the utopia of symmetric information where all market participants have the same, or equally much, information. Akerlof (1970) uses the secondary market of automobiles in the U.S. as an example to show the difficulty in distinguishing good quality and he points out that information superiority will benefit the holder. Connecting this to the previously discussed phenomenon of IPO underpricing, the information

asymmetry creates a gap between informed and uninformed investors, discussed e.g. by Grossman (1976), Leland & Pyle (1977) and Rock (1986).

Grossman (1976) suggests that when the informed investors trade, the price reveals their beliefs in the future of the company. Since the uninformed investors do not invest any resources into information, they solely study and observe the current prices (i.e. the informed investors' beliefs) when making their investment decisions. Therefore, Grossman considers the market to be efficient. The efficient market hypothesis suggests that all information available on the market is reflected in the price of the stock. Abnormal first day returns would then be explained by an offer price not set in accordance with the true value of the firm. This aware underpricing can be used to achieve large demand (Brennan & Franks, 1997) or to create an informational momentum (Aggarwal et al., 2002).

Comparing the lender and the borrower Leland & Pyle (1977) consider the borrower to be the informed party since they typically know their collateral and moral rectitude better than the lender. They also stress that, for good projects to be financed, information transfer most occur. Rock (1986), on the other hand, believes the lenders are the informed group since they as a unit have greater market knowledge and are therefore less biased in their judgment. He also concludes that the greater the uncertainty of the true price, the greater the advantage of the informed investor. The presence of asymmetric information on the financial market has made room for several theories related to IPO underpricing. Below three, for this thesis paper relevant, theories are presented.

2.4 Underpricing theories

2.4.1 Winner's Curse

When an IPO is underpriced, demand exceeds supply and the company and the underwriter ration the shares. Consequently, if the demand is weak, all subscribers are allocated their full share. So, if you get your share filled the stock price is likely to go down and when you are rationed shares, the price is likely to go up. This adverse selection problem is called the *Winner's Curse* (Berk & DeMarzo, 2011). This means that you "win", i.e. get full allocation, if the demand is low and the IPO is expected to perform poorly. Rock (1986) presents a model where the informed investor is only going to invest if the realized value per share is greater than the offer price. Because of this, the uninformed investors cannot predict the size of their allocation since it depends on the realized value compared to the offer price. If the realized, or true, value is lower than the offer price the uninformed investors will get full allocation asked and vise versa. This results in a downward valuation from the uninformed

investors and implies that it might be necessary for the underwriters to underprice the IPO to ensure demand from uninformed investors.

To overcome the winner's curse problem, investors must find mispriced securities. In the case of mispriced securities Rock (1986) argue that informed investors have an advantage over other investors. This is because the price does not correspond to the underlying demand, which according to Grossman (1976) is the main source to achieve market efficiency. The greater the uncertainty of the true price, the greater the advantage of the informed investor. Beatty & Ritter (1986) find that there exists correlation between underpricing and the uncertainty about the true value of the firm and the ex-IPO performance. This would strengthen the argument of Rock (1986) about the advantage of information.

2.4.2 Informational Cascade

Informational Cascade refers the phenomenon when investors follow each other in some kind of herd behavior. There are several reasons for this. One reason is that they believe other investors hold superior information. The information cascade effect then leads to investors not following their own information and beliefs, fully trusting the information of others. Another reason for this herd behavior is that investors are constantly comparing themselves with their peers and the result orientation, or risk of lagging behind, creates informational cascades (Berk & DeMarzo, 2011). Bikhchandani et al. (1992) argue similarly that actions of individuals will influence to the extent that later, other investors follow without questioning or listen to their own information. As time goes, the cascade will grow stronger.

One event that might break the cascade is a release of public information. Since the release will bring more enlightening information about the object, Bikhchandani et al. (1992) suggest that the decisions of previous investors will not be as influential to the later investors, as it would be without the new information. On the other hand, if the new public information follows the same path as earlier investors, it will strengthen the cascade and not break it. Welch (1992) shows, using a cascade model, that if demand to sign up for IPO shares is high early on, others will follow. The opposite effect goes if demand is weak.

Ritter (1984) comes to the same conclusion as Ibbotson (1975), about the existence of periods with abnormal returns on new issues. Ritter calls this a "Hot Issue Market" and find that these periods are followed by periods with increased volumes of IPO's. Besides asymmetric information, Ritter explains

this by growth in specific sectors such as the oil industry in the 80's and the IT-bubble around the millennial (Ritter, 1984; Ritter, 2002).

2.4.3 Signaling Theory

To reduce the gap between informed and uninformed investors, managers try to signal the true value of the firm. This signaling procedure can be accomplished in different ways, for example by leveraging, dividends or underpricing (Berk & DeMarzo, 2011). The signaling theory explains underpricing of an IPO as a signal from the informed party (in this case the company) about a high-quality investment. By underpricing, the company takes on costs that would not be beneficial or possible if the investment was of lower quality, which potential investors recognize (Allen & Faulhaber, 1989). Leland & Pyne (1977) claim that without information transfer the market would perform poorly, but they also think that due to moral hazard investors should not expect all existing information to be available. Even so, they argue that actions taken by the entrepreneur will give strong indications about the quality and should be seen as trustful information. If the most informed investor, the entrepreneur or manager is investing in the company so should also the market. These thoughts are coherent with the once presented by Grossman (1976).

Allen & Faulhaber (1989) assume that the most informed party is the owners themselves. They also believe that an underpriced company might *"leave a good taste in investors' mouths' so that future underwritings from the same issuer could be sold at attractive prices"*, suggesting underpricing could be used to build reputation and not only as a signal of quality. The Swedish Insider Fund, Insider Sweden, is trading according to the theories presented above. After detecting significant outperformance of the market from insider traders, Lidén and his colleague built an insider model that follows insiders (Insiderfonder). The model is buying and selling on specific patterns, or signals, from informed investors and has over the years outperformed comparable indexes (Avanza).

2.5 Management ownership

When doing an IPO with newly issued shares the ownership becomes dispersed if shares are sold to outside investors. In that case, pre-IPO owners will suffer from decreased control. To overcome this, firms and underwriters use underpricing to ensure oversubscription and ability to ration the issued shares, leaving only minor external shareholders (Booth & Chua, 1996; Brennan & Franks, 1997; Ritter & Welch, 2002). The indirect cost of underpricing, i.e. low price, is in this case considered a necessity to maintain voting control. On the upside, dispersed ownership will lead to higher liquidity on the secondary

market (Booth & Chua 1996). Lack of the desired allocation leaves potential investors with liquidity that may be used to acquire shares at a higher share price, triggering the price upwards. The idea of underpricing in order to achieve disperse ownership is by Brennan & Franks (1997) named *the reduced monitoring hypothesis* and their results suggest a negative correlation between underpricing and the size of large outside block holdings.

Between 1990-1998 the average IPO on the U.S. market left 9,1 million dollars on the table, i.e. the number of shares sold at each IPO times the price gain during the first day of trading (Loughran & Ritter, 2002). Loughran & Ritter (2002) explain this with the covariance between underpricing and changing in wealth of the firm's decision makers. The pre-IPO owners within the company have an increased wealth after the IPO when the share is underpriced. At the same time underpricing leaves money on the table and leads to more dilution than necessary for pre-IPO owners. According to prospect theory, issuers care more about the change in wealth rather than the level of wealth, why money left on the table are compensated by first-day returns (Loughran & Ritter, 2002).

In line with previous theory, Habib & Ljungqvist (2001) find a negative correlation between insider selling in connection to the IPO and underpricing. This means that an insider who sells his shares in connection with the IPO will be more interested in setting a price closer to the true value than someone who keeps his/her shares would, since the one selling out is making a certain loss in case of underpricing. Another thing stressed by Habib & Ljungqvist (2001) is the importance of setting a price accepted by important investors, which will be followed by others. Daniel (2002) further discuss this taking the IPO of Microsoft as an example, where half of the important investors threatened to drop out if Microsoft would raise the initial price. This would have been bad for Microsoft both economically and reputation wise.

Loughran & Ritter (2002) argue that many IPO-companies are young, have a large block of equity owned by managers and are in most cases in a very expansive stage. Aggarwal et al. (2002) study a sample of 618 IPOs between 1994-1999 and compare internet IPOs to non-internet IPOs. They find significant evidence that managers strategically underprice IPOs to create an information momentum for the firm and realize their wealth by selling shares after their lock-up period. They explain this as "*higher ownership by managers is positively correlated with underpricing, underpricing is positively correlated with research coverage, and research coverage is positively correlated with stock returns and insider selling at the lock-up expiration*". Their findings are in line

with Loughran & Ritter (2002) findings based on prospect theory that managers are not unhappy with underpricing.

2.6 Guarantors & commitments

In connection with an IPO and share issuance and/or selling of existing shares it is common that the offering is fully or partly committed and/or guaranteed. In the following sections, commitments and guarantors will be shortly explained and related to existing literature.

2.6.1 Subscription commitments

Existing and/or non-existing shareholders in many IPOs commit to purchase shares to be certain about full allocation. The commitments are most of the times done by important shareholders, people important to the company and new shareholders that would be of vital importance to the future of the company. They receive no commission for their commitment but are, depending on the agreement and interest for the IPO, promised allocation of the committed number of shares (or at least a part of it).

2.6.2 Guarantor commitments

When the issuer wants to secure the whole, or part of the, issuance it has the possibility to offer a guarantor commitment to investors. These investors are usually private investors and entities owned by private investors and are not shareholders prior the IPO. However, being a guarantor is not offered to all private investors before the prospectus is announced to the public, but to more known people with much capital. The contract between the two parties obliges the investor to purchase a certain number of shares in case of the issuance not getting fully subscribed. This guarantee can either be a bottom guarantee or a relative guarantee of the investors guaranteed capital. The difference is that if e.g. the issuance is 100 shares and 50 shares get subscribed, a bottom guarantee of 50 shares does not have to purchase any shares whereas the relative guarantor has to purchase his relative part e.g. 25 shares. For the guarantee, the investors are paid a commission on the guaranteed capital, usually around 5-12 percent. This commission is supposed to reflect the risk the guarantor is exposed to through such a contract (d'Agostino et al., 2007).

2.6.3 Previous empirical research

International research has focused on different types of underwriter commitments. The guarantor commitments described above appears to be a Swedish phenomenon and are not covered in previous literature. Therefore, it will be related to other types of commitments that are better covered. A brief description of different contracts and commitments is presented in Table 1.

In firm commitment contracts, the shares of the issuance are sold from the issuer to the underwriter. The underwriter then makes its profit on the spread between what it purchased the shares for and the price offered to the public. In best effort contracts', the underwriter tries to sell as many shares as it can (to an upper limit) in a price interval and the issuance only takes place if at least a certain amount of shares can be sold. Mandelker & Raviv (1977) argue that the risk in the best effort contract lies on the issuer while in a firm commitment contract the risk lies on the underwriter. Ritter (1987) finds that the indirect cost (underpricing) is larger for best effort offers than for firm commitment offers. Ritter (1987) argues that the uncertainty for some companies forces them to use best effort offers since the discount they would have to give the underwriter would be too costly. Benvestine & Spindt (1989) theoretical model also states that firm commitment contracts are less underpriced than best effort offers.

An underwriter syndicate is a group of underwriters working together to sell shares to the public. It usually happens when an offering is too big for a single underwriter to handle. Thus, the lead underwriter gets help from other investment banks to carry out the issuance. Corwin & Schultz (2005) analyze 1,638 underwriter syndicates in Italy between 1997-2002 and how they produce information about the issuer. One of Corwin & Schultz findings is that the likelihood of price revisions during the filing period is increasing with the number of firms in the underwriting syndicate, both revised price up (down) in response do positive (negative) information. Also, a revised price upward generally leads to reduced underpricing. Even so, underwriting syndicate and IPO underpricing show no significant relationship. The effect in Corwin & Schultz (2005) analysis is hence limited to what happens during the filing period and does not have any findings on the underpricing of the IPO.

Table 1 - Contracts and commitments

What contract	Who	How	Commission
Firm commitment	Underwriter	An underwriters purchase all shares of the issuance from the issuer and sells it to the public	Spread between purchased shares from issuer and sales price to the public
Standby agreemnt	Sub-underwriters; other underwriters, banks, lenders	Lead underwriter and sub-underwriter all market the shares. Uncertainty on how many shares each sub-underwriter will be allocated and paid commission for	Lead underwriter gets paid fixed fee and percentage of sold capital. Sub-underwriters get paid percentage of sold capital
Best effort	Underwriter	An underwriter tries to sell as many shares as possible and issuance will only take place if at least a certain amount is brought in	If the issuance is successful the underwriter gets paid
Guarantor commitment	Private investors	Guarantor is obligated to subscribe for shares not filled by the public offering	Percentage of committed capital
Subsription commitment	Private investors	Investors commit to subscribe shares to be certain to receive shares	None

Note - Description of different contracts and commitments in an IPO. Information on Who is part of the contract besides the issuing firm, How the agreement between the issuer and the underwriters is arranged and what Commission the second part receives.

3. Hypotheses

In a firm commitment contract, the risk transfers from the issuer to the underwriter (Mandelker & Raviv, 1977). The underwriter is compensated by the difference in price paid for the shares compared to what the public is willing to pay for it. This risk is similar to the one guarantors is exposed to and get compensated for. The commission paid to the guarantors indirectly means that if the guarantors have to buy shares, they do it at a lower price than the public do. Also, Corwin & Shultz (2005) find that bigger underwriting syndicates increase the likelihood of price revision during the filing period, which in the end reduces underpricing. Increased likelihood happens because a bigger syndicate increases the possibility to generate new information about the issuer. We argue that in the same way, guarantors indicate information that in the end reduce underpricing. *Winner's Curse* means that the informed investors have an advantage over the uninformed investors, and the advantage is bigger as the uncertainty about the ex-post performance increases (Beatty & Ritter, 1986). Underpricing and uncertainty about the true value of the firm are correlated (Beatty & Ritter, 1986). Guarantors decrease uncertainty and they would not guarantee if they believe that the realized value is lower than the offer price minus the commission they receive. But, they still must believe that other investors will pay the original IPO price since they do not want to risk a price drop. These three arguments set the first hypothesis.

Hypothesis 1: Guarantors decrease underpricing.

According to Grossman (1976), informed investors set a price given their beliefs in the future of the company. A larger portion of informed investors would then suggest an offer price closer to the true value and less underpricing. Even so, Brennan & Franks (1997), among others, find that firms underprice by purpose to achieve large demand. This way they can ration the shares and retain preferred control. Loughran & Ritter (2002) suggest that the investors care more about change in wealth rather than the level of wealth, suggesting a positive attitude towards underpricing. Aggarwal et al. (2002) supports this and find that the level of management ownership pre-IPO is positively correlated with underpricing. Built on this reasoning, we present our second hypothesis.

Hypothesis 2: Management ownership increase underpricing.

As established above, management can be considered informed investors. An investor who commits, either management or non-management, knows the offer price before they commit. Rock (1986) argues that informed investors would only be investing if the realized value were greater than the offer price. This

suggests a manager leaving commitments knows that the price is set below the true value. Thus, the signaling of informed investor commitments will lead to an informational cascade, i.e. increased demand of the new issuance, since the uninformed investors will follow the informed ones. The raised demand will result in rationing of shares, which in turn leaves more liquidity on the secondary market and a triggered price (Booth & Chua 1996). Altogether, this forms the third hypothesis.

Hypothesis 3: Management commitments increase underpricing.

4. Data & Methodology

4.1 Data

4.1.1 Choice of markets
The sample consists of IPO activity on the two Swedish trading places Nasdaq First North and Aktietorget where the number of listings has been big during recent years. Guarantors are a phenomenon that only occurs on these unregulated lists and not in a single IPO on Nasdaq Stockholm during our period of interest (Appendix I). First North is owned by Nasdaq OMX Group whereas Aktietorget is owned by ATS Finans AB. The lists are so called MTFs (Multilateral Trading Facility) and are usually used as a first way into the public stock market for small, young and fast growing companies that do not have the capacity to enter a larger, regulated marketplace. Regulations at Aktietorget and First North are less comprehensive than on regulated markets, hence cheaper and less time consuming for the companies who can focus more on their business. Comparing the lists, they do not apply an identical set of regulations but the differences are small. For instance, Aktietorget requires a company to have at least 200 shareholders whereas First North requires 300. Also, First North requires a company to use a certified advisor, approved by First North, to ensure that it follows regulations and requirements. Aktietorget controls this themselves. The costs of going public are also a bit higher on First North, and since some of the costs are variable it differs, but maximum twice the price on First North. This implies that First North has larger companies, but we believe the lists are comparable, containing similar kind of companies and together they give us a usable dataset.

4.1.2 Data collection
We find sparse previous research on the mentioned lists, why we find them interesting to study. Also, Aktietorget and First North consist, to a large extent, of small and young companies, which might affect the level of underpricing and management composition. To find desired information,

prospectus or memorandum of association has been used. These have been collected from company webpages, online at Aktietorget's & First North's webpages and in direct contact with the two market places. From the documents, secondary data has been collected by hand. Data of listing date, firm age, industry, prevalue, offer size, listing price, inside ownership, A & B shares, guarantors and buying commitments is collected. Listing price will be compared to the closing price on the first day of trading to check for underpricing. The closing price is obtained from Aktietorget and First North and is the only data not accessible in the prospectus/memorandums. For companies that are not longer listed on First North, information on closing prices were not available online but provided through direct contact with First North.

4.1.3 Sample size

The years selected (2010-2016) are chosen due to market conditions. During 2008 the world faced a financial crisis, which also affected the Swedish economy. In 2010 Sweden and the Swedish stock market was again recovered why the analysis starts from there (Ekonomifakta). Thus, by starting from 2010 we avoid estimates affected by the financial downturn, yet we have a sample filling the criteria of approximate normality.

During 2010-2016 162 companies was listed on Aktietorget and 207 on First North. This gives a total sample of 369 observations. A pure IPO with equity issuance or selling of existing shares pre-IPO is a necessary condition that must be met. In the sample, some IPOs have been excluded due to different reasons. Events like carve-outs, spin-offs, and reversed take-over are not listings in combination with equity issuance or selling of already existing shares. Owners of a listed company from these categories own it because he/she owned another company prior. Thus, the process of listing and the first-day return has different prerequisites than a pure IPO. Changed list, only listing and parallel listings are not IPOs either, but already existing shareholders given a chance to trade in a new/different market place. Finally, preferred shares are different from regular shares regarding dividends and often voting rights, leftover assets in case of liquidation, etc. Table 2 summarizes different exclusion and gives a final sample size of 210 IPOs.

Table 2 - IPO exclusions

Event	Excluded	Net Firms
Listings on Nasdaq First North and Aktietorget 2010 - 2016		369
Carve-outs, spin-offs, reversed take-overs, changed list, only listing, parallel listing	-127	242
Preferred shares listing	-14	228
Missing memorandums, not complete information	-18	210
Sample size		210

Note - Summary of exclusion reasons from all IPOs to pure IPOs with equity issuance on Aktietorget and Nasdaq First North between 2010-2016.

4.2 Regression

To examine the relationship between underpricing and the factors presented in the hypotheses, we will use Ordinary Least Squares (OLS) estimation. The method is a common way when regressing underpricing on different variables (Loughran et al., 1994; Aggarwal et al., 2002; Abrhamson et al., 2011) In Table 3 we present the variables used in this study. These are further described below.

Table 3 - variables

Dependent variable: Underpricing
Independent variables
Guarantors
Management Ownership
Management Commitment Dummy
Independent control variables
logage
logoffersize
Industry (HighTech dummy)
A/B shares dummy
Year dummies

Note - Variables we use in this study on underpricing.

4.2.1 Dependent variable

The dependent variable is underpricing. We define underpricing as the first-day return, i.e. that the closing price of the first day of trading compared to the offer price. This definition of underpricing is used e.g. by Rock (1986), Ritter (1998) and Loughran et. al (1994). One could argue that the return should be adjusted for market movements, but Loughran et al. (1994) find the average initial return for IPOs to be 14.1 percent and average market return to be less than 0.1 percent. Adjusting for market returns would thus minimally affect, and it will not be included in our regressions. By not adjusting it our results will also be more comparable to previous research. In Table 4 we show the result on adjusted underpricing, adjusted by the relevant indexes *AT Index* and *First North All-Share.*

$$\text{Underpricing} = \frac{CP_i - OP_i}{OP_i} \tag{1}$$

Where CP_i = closing price first day of trading for share i

OP_i = offer price at IPO for share i

4.2.2 Independent variables

Guarantors

We have not found the phenomenon guarantor commitments in previous literature. Even so, we believe that guarantors have similarities with firm commitment contract, which Mandelker & Raviv (1977) conclude is negatively affecting the underpricing compared to best effort contracts. The variable guarantors will be used to test hypothesis 1; Guarantors decrease underpricing. Guarantor commitments are presented in the prospectus/memorandum and we have divided it with the offer size (SEK). Thus, we get a ratio comparable between observations.

$$\frac{\text{Guarantor commitments (SEK)}}{\text{Offer size (SEK)}} \qquad (2)$$

Management ownership

This variable will be used to test hypothesis 2; Management ownership increase underpricing. We have defined management ownership as the percentage of the company owned by the board of directors, chief executive officer or other top management presented in the prospectus/memorandum, which is in line with how Aggarewal et al. (2002) define it. Also, the Swedish Financial Supervisor Authorities (2011) state that important managers, executives and board member shall disclose information regarding ownership in the prospectus/memorandum before trading starts at a Swedish MTF. Converting it into percentage makes it possible to compare between observations.

$$\frac{\text{Management ownership pre-IPO (shares)}}{\text{Nr. of shares pre-IPO}} \qquad (3)$$

Management commitments

The independent variable management commitments will be used to test hypothesis 3; Management commitments increase underpricing. Management commitments are presented in the prospectus/memorandum and will be used as a dummy. This is because we assume that the actual signal of committing is more important than the level of commitment for a potential investor.

$$\text{No Management commitment} = 0 \qquad (4)$$

$$\text{Management commitment} = 1$$

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4.2.3 Independent control variables

The variables presented below are all previously shown to affect the level of underpricing on IPOs and are therefore controlled for to avoid omitted variable bias (Stock & Watson 2012).

Age

An old firm has more historical data than a younger firm. The connection between the age of a firm and a higher quality has been studied by e.g. Ritter (1998), Certo et al. (2001) and Chemmanur & Paeglis (2005). Ritter (1998) find that old firms financially outperform younger ones both prior and after the IPO. Certo et al. (2001) use these findings and argue that the uncertainty a young firm indices may affect the offer price, the first-day returns or both. We will use firm age as a control variable and operationalize it in the same manner as Certo et al. (2001) and Chemmanus & Paeglis (2005) do; take the log of one plus the firm age. Firm age is calculated as the difference between the calendar year the firm is offered to the public and the calendar year it was founded.

Offer size

One commonly used control variable is offer size, or gross proceeds (Ibbotson et al., 1994; Ljungqvist, 1997; Ritter, 1998). Ibbotson et al. (1994) find that the size of the offer is negatively correlated with underpricing; saying small offerings are more underpriced than large offerings. The initial returns also tend to be more volatile for smaller issuances. All three articles presented use offer size in monetary values. Therefore, we define offer size in SEK. We take the natural logarithm of offer size in order to reduce the effect of outliers.

High-tech dummy

The value of a firm is its future earnings and when the future is more dependent on the firm's growth opportunities, the future is more uncertain. Lowry et al. (2010) find that initial returns are higher for firms that are harder to value i.e. have more information asymmetry. They study IPOs between 1965-2005 and find higher initial returns for firms in high-tech industries. Also, during the dot-com bubble, as they define between September 1998 – August 2000, they find mean return of 90 percent compared to the full sample period which experienced a mean return of 15 percent. The mean return during the dot-com bubble is in line with the results presented by Ljungqvist & Wilhelm (2003). We take potential high-tech specific underpricing into account by adding a dummy high-tech in our regression. The method is the same used by both Lowry et al. (2010) and Ljungqvist & Wilhelm (2003). Further, to classify which industry each company is operating in we use the same classification as Aktietorget and First North does.

A/B shares

Companies with both A and B shares are common on Swedish market places, with A shares giving more votes than B shares. Often, this leads to one or a few shareholders controlling the public companies without holding a corresponding share of equity (Gilson 2006). Gilson (2006) argues that shares with different types of voting control are apparent in almost all countries except the United Kingdom. We do not find literature taking dual class shares into consideration when looking at underpricing of IPOs. Yet, Holmén & Högfeldt (2004) find that without encouragement of separation of voting rights and capital the IPO activity on the Swedish market would have been reduced. A-shares give the management owners less incitement to ration shares and also affect the level of demand in the IPO. Therefore, a dual class share dummy variable will be used to control for differences between companies having one or two types of shares.

Year dummies

Historically, there have been periods with abnormal returns on IPOs, such as during the dot-com bubble in 1999 (Ritter & Welch, 2002). Ritter (1985) call this *the hot market phenomenon* and find it explained by natural resource issues, a theory supported by Ljungqvist & Wilhelm (2003). During the period of investigation (2010-2016) we find no evidence of strong hot markets. Despite this, to exclude possible time effect on our results we add year dummies to our regressions. Ljungqvist (1997) use similar dummies and find that issuers gain from going public during hot market conditions.

4.2.4 Regression summary

Regressions will be run with underpricing as dependent variable both with the independent variables alone and with the independent variables accompanied by the control variables. Below, we present the regression for the independent variable guarantors with chosen control variables. We will run similar regressions changing the variable guarantors* for management ownership and management commitments.

$$\text{Underpricing}_i = \beta_0 + \beta_1 \text{Guarantors}_i^* + \beta_2 \text{logage}_i + \beta_3 \text{logoffersize}_i \qquad (5)$$
$$+ \beta_4 \text{High-techdummy}_i + \beta_5 \text{A/B-sharesdummy}_i + \text{Yeardummies} + u_i$$

4.2.5 Robustness tests

Multicollinearity

Multicollinearity refers to when two or more explanatory variables in a multiple regression are highly correlated. In most cases, weak correlation between variables can be present without affecting the results. In cases where high correlation (multicollinearity) is identified though, the coefficient is estimated

imprecisely and adjustments to the regression might be needed (Stock & Watson 2012).

Heteroscedasticity

The definition of heteroscedasticity is that the variance of the error term is not constant across the observations (Brooks, 2014). It is a violation against one of the key assumptions for OLS and the consequence of heteroscedasticity is that the coefficients are not longer the best linear unbiased estimators. They remain unbiased but do not have the minimum variance across observations anymore. The presence of heteroscedasticity is common in cross-sectional data (Long & Ervin, 2000) and is, therefore, important to test for in this study.

Normality

We will run a normality test to see if the data set is normally distributed. Normality will be tested with Skewness and Kurtosis tests. Skewness measures the extent of which the distribution is not symmetric around its mean, while kurtosis measures the size of the tails. Without testing, a sample size larger than 30 is generally accepted as an approximate for normality.

5. Result & Analysis

5.1 Descriptive statistics

Table 4 - Descriptive statistics

Variable	Mean	Std. Deviation	Min	0,25	Median	0,75	Max
Underpricing	12.0%	42.4%	-60.0%	-10.4%	2.9%	24.1%	310.7%
Underpricing adj.	11.9%	42.2%	-59.4%	-10.1%	3.2%	24.3%	309.2%
Guarantors	13.4%	27.0%	0.0%	0.0%	0.0%	0.0%	100,0%
Management ownership	47.1%	30.1%	0.0%	20.8%	45.6%	71.7%	100,0%
Management commitments	2.8%	9,1%	0.0%	0.0%	0.0%	1.0%	89.0%
Age (Years)	12.3	16.1	1	5	8	14	132
Offersize (Million SEK)	50	120	1	8	15	30	1100
Sales (Million SEK)	55	160	0	0.3	4	32	1300
Assets (Million SEK)	69	200	0.02	6	13	42	1900
Prevalue (Million SEK)	150	410	2.7	26	45	120	3500

Note - The dataset consists of 210 companies listed on Aktietorget and First North between 2010-2016. Each variable of interest for this research is presented on the first vertical line and the dependent variable for the research is underpricing. This table gives an overview on the distribution of each variable. Underpricing refers to the first day return, Guarantors & Management commitment are percentages of the offer size and Management ownership is based on the percentage of shares held by the management pre-IPO. The Age is the number of years from the company was founded until it was listed and sales is the latest 12 months presented before listing.

Our descriptive statistics and variables' characteristics are presented in Table 4. The sample of 210 IPOs on Aktietorget and First North show a mean underpricing of 12.0 percent. The market adjusted return is 11.9 percent, which only differs 0.1 percent from the non-market adjusted return and is in line with Loughran et al. (1994). The rest of the results will not be adjusted for market returns. The level of underpricing is similar to what literature find (excluding

research on the dot-com bubble). Both Booth & Chua (1996) and Ljungqvist & Wilhelm (2003) presents median underpricing less than half of mean underpricing, which makes our median of 2.9 percent reasonable in comparison.

The worst first-day performance is -60 percent and the best is +311 percent. With a mean of 12 percent, this indicates a skewed distribution. The worst and best performances on the first day of trading are extreme values, why we have carefully double-checked the top and bottom 5 percent of the observations. The standard deviation of 42.4 percent is higher than Lowry's et al. (2010) standard deviation of 31 percent in their data between 1991-2005 on the US market. Also, the best and worst first day performance for Abrahamson et al. (2012) on Nasdaq OMX is -23 percent and +96 percent, which indicates less standard deviation in their data. Small and young companies contain more uncertainty, why the higher deviation on our data is expected.

Underpricing for different years is presented in Appendix II, 2012 generated the lowest mean return of -3.9 percent whereas 2013 generated a mean return of 28.3 percent. However, these years do only have ten and twelve observations respectively, which makes possible conclusions weak. The mean underpricing on Aktietorget is 14.9 percent and on First North 8.5 percent (Appendix III). The difference is not significant and therefore we cannot draw any conclusions regarding different underpricing on Aktietorget and First North.

Guarantors have on average committed 13.4 percent of the issuance. We find guarantor commitments in 50 observations and only looking at these, the average commitment level is 55.6 percent. Since most companies require a 50-60 percent subscription ratio in order to realize the IPO, this average guarantor level is reasonable. Further, we find that management ownership is fairly normally distributed with values ranging from 0 to 100 percent, with mean and median only differing by 1.5 percent.

We find management commitments in 68 observations of 210. Looking at the whole sample, the average commitment level from managers is 2.8 percent. This can be compared to 8.7 percent average commitment level from managers in the 68 observed companies who have management commitments. Either way, this shows that managers do only commit to a minor part of the issuance. The low level of management commitment strengthens our argument about using a dummy variable since signaling of commitment seems to be more important than the level of commitment (for potential investors).

The companies have a mean age of 12.3 years and half of the companies are eight years or younger. Median offer size is rather small with a value of 15

million SEK, but a mean of 50 million SEK. The distributions of both these variables are skewed (see section 6) and our motivation to logarithm them in our regressions is reasonable. Half of the companies have sales of 4 million SEK or less twelve months pre-IPO, implying that Aktietorget and First North indeed are lists for young and expanding firms. Noteworthy is also that prevalue is not part of the regressions, but listed in Table 4. Using both prevalue and offer size resulted in multicollinearity, why we chose to exclude prevalue. Doing so, we get less bias estimates and more reliable coefficients.

5.2 Regressions result & analysis

Table 5 - Regressions

Dependent variable: Underpricing	Expected sign coefficient	1	2	3	4	5	6
Independent variables							
Guarantors	-	-0.181	-0.235				
		*0.067**	*0.019***				
Management Ownership	+			0.052	-0.042		
				0.529	*0.634*		
Management Commitment Dummy	+					0.079	0.083
						0.297	*0.232*
Independent control variables							
logage	-	0.013	0.013		0.017		0.018
		0.670	*0.670*		*0.573*		*0.566*
logoffersize	-		-0.052		-0.046		-0.042
			*0.043***		*0.095**		*0.100**
HighTech dummy	+		0.217		0.211		0.207
			*0.061**		*0.075**		*0.070**
A/B shares dummy			-0.109		-0.110		-0.112
			*0.088**		*0.079**		*0.080**
Year Dummies		No	Yes	No	Yes	No	Yes
Intercept		0.144	1.034	0.095	0.918	0.094	0.783
		*0.000****	*0.028***	*0.071**	*0.076**	*0.000****	*0.089**
R2		0.013	0.138	0.008	0.117	0.008	0.124

Note - All regressions consist of observations from 210 companies listed on Aktietorget and First North between 2010-2016. The dependent variable is underpricing, which is defined as the return on the first day of trading. The *expected sign coefficient* is based on reasoning in previous sections and refers to whether the independent variable is expected to have a positive or negative effect on the dependent variable outcome. Guarantors refers to the portion of the offer that is guaranteed by investors prior the listing, Management ownership refers to the degree of ownership by the management pre-IPO and the Management commitment dummy refers to whether management has committed to buy shares in the listing. The age of the company and the offer size is logarithmic. Each number on the horizontal top row represents a regression, which is paired with variables of concern (in the first vertical row) in the matrix. Below each presented coefficient in the matrix the reader can find its p-value. * represents coefficient significance on a 10 percent level, ** shows significance on a 5 percent level and *** represents significance on a 1 percent level. The R2-value shows the explanation rate of the regression, ranging from 0 to 1.

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Our regression results are presented in Table 5. The first and second regression shows a significant impact of the variable guarantors on underpricing. The control variables further improve the significance of guarantors on underpricing. The interpretation of the coefficient for guarantors in regression 2 is that a one percent increase of guaranteed capital decrease underpricing with -0.235 percent. This supports our first hypothesis that guarantors significantly decrease underpricing. Ritter (1987) find that firm commitment contracts are less underpriced than best effort contracts. In a firm commitment contract, the risk is transferred to the underwriter (Mandelker & Raviv, 1977), which is also the case for a guarantor who takes on risk. Just like an underwriter in a firm commitment contract would not enter the contract if it did not believe it could sell the shares at a higher price, a guarantor does not guarantee at a given price if he believes the value of the company is lower than that given price. Even though a guarantor is an external investor and an underwriter's responsibilities and ability to act during the IPO-process is bigger than the guarantor's, we believe that our argumentation that guarantors effect the underpricing similar to how a firm commitment contract do therefore hold.

Grossman (1976) suggest that the price reveals informed investors belief in the future of the company when he trades. We have argued that a guarantor has invested resources in acquiring information about the company before he guarantees, thus uninformed investors who do not invest in information can follow. Beatty & Ritter (1986) find correlation between uncertainty about the true value of the firm and underpricing. The information guarantors provide with their guarantee will decrease uncertainty, thus decrease underpricing.

Because of the commission, the guarantor's price per share is lower than the IPO price, but he still believes other investors will buy at the higher price. This argumentation can also be applied to the winner's curse theory where Rock (1986) argues that the informed investor only invests if the realized value per share is greater than the offer price. The guarantor would thus not invest if he believes that the realized value is lower than the offer price minus the commission he receives. But, he still must believe that other investors will pay the original IPO price to avoid negative momentum. Guarantors verify the IPO price but because of the commission paid it is also a bit ambiguous compared to a non-commission commitment.

We expected a positive sign on the coefficient management ownership but the result from the regression is insignificant. According to *the reduced monitoring hypothesis* presented by Brennan & Franks (1977), companies underprice shares in order to be able to ration and avoid large outside investors. Our results show

no sign of this behavior and we believe that one reason for this is A- and B-shares with different voting control, existing in many companies. We find significance on a 10 percent level on our control variable for dual class shares, which indicates that superior voting control on A-shares leave less incitement for the company to underprice in the case of the company selling new issued B-shares to the public.

The informational momentum creation presented by Aggarwal et al. (2002) is not found in our study and one reason for that is probably the size and age of companies listed on Aktietorget and First North. Smaller companies create less media coverage and younger companies contain more uncertainty about the future, which both lowers momentum. Therefore, underpricing in order to achieve increased demand and a triggered price might not be as attractive on these smaller lists. Also, Aktietorget and First North have less media coverage overall. We also use the first-day return, which limits the possibility to uncover informational momentum until the lock-up period expires.

We only find 16 cases where the owners sell off shares. In all other 194 observations, the offer is with newly issued shares, which is not in line with Ritter & Welch (2002) and suggests less importance to liquidate for managers in companies listing on Aktietorget and First North. Since almost no management is selling in connection with the IPO, the negative correlation between insider selling and underpricing found by Habib & Ljungqvist (2001) becomes difficult to detect. Loughran & Ritter (2002) argue that money left on the table is compensated by first-day returns for pre-IPO owners. We find underpricing, which is in support of this theory, but we cannot link this underpricing to the level of management ownership.

The regression gives positive, yet insignificant results on the management commitment dummy variable. The positive sign was expected but its insignificance entails that we cannot draw any conclusion about our third hypothesis. Leland & Pyne (1977) argue that informational transfer is key to an efficient market. The informational transfer will reduce the gap between informed and uninformed investors and signals from committing managers about a lower offer price than true value should be a trigger for uninformed investors. The insignificance of our results might have many explanations, but we believe that one is the less coverage of Aktietorget and First North. Less attention leads to less demand and not the same "herd" behavior, which results in less rationing of shares and less liquidity on the market. Lower momentum decreases the signaling value of management commitments, which suggest less incitement for the managers to underprice the shares.

Another reason for insignificance can be different signaling value from different levels of management. A CEO commitment might, for example, have a larger signaling value than a commitment from someone else in the company. Therefore, to separate the commitments or only to look at CEO commitments would possibly have generated a more significant relationship.

To reduce the influence of extreme values, we used logarithmic values of age and offer size in the regressions. The coefficient of age is insignificant in all regressions in contrast to previous research like Certo et al. (2001) and Chemmanur & Paeglis (2005) who both find negative correlation between firm age and underpricing. We believe that one reason for the insignificant results is the fact that firms on Aktietorget and First North are uniformed age-wise, with a large number of young firms. The scarce number of older firms makes the age effect difficult to detect even if it exists. The offer size in our data is significant and negative correlated with underpricing, as expected, and the result is in line with what Ibbotson et al. (1994) find. Larger firms often do large offerings and smaller firms often do small offerings. Small companies are associated with more uncertainty, hence more underpricing.

The High-tech dummy is significant and positive on 10 percent level in all regressions. Previous studies find the high-tech dummy significant as well, especially during hot markets. For example, Ljungqvist & Wilhelm (2003) find high-tech firms to be more underpriced than others, especially during 1999-2000. Even though we have no hot market during the studied period, our results are consistent with previous research.

Furthermore, a dummy variable for dual class shares is used. We argue that dual class shares could influence underpricing, especially in connection with ownership and dispersion, since the shares contain different voting rights. We find our dummy variable significant negative at a 10 percent level, indicating that firms with dual class shares are less underpriced. With dual class shares, the company has less incitement to underprice since the raised demand and rationing of shares becomes less necessary to maintain voting control.

Finally, we have run a regression with all independent variables and independent control variables together. No severe correlation between the variables is found and our major results remain unchanged.

6. Robustness

To check for multicollinearity, we have tested the variance inflation factor (VIF) and generated correlation matrices. The VIF test measures how much the variance increase due to multicollinearity. Following the guidelines of O'Brien (2007) a VIF below 10 is desired and if the regression is weak (R2 value below 0.2), a VIF below 4 is desired. The test results are presented in Table 6, 7 and 8 and show no VIF above 4. This means that the variance is not inflated due to multicollinearity. According to Brooks (2014) correlation between two explanatory variables higher than |0.8| is a clear sign of multicollinearity. The multicollinearity matrices for the three regressions show no values higher than |0.8|, denoting the data do not suffer from high multicollinearity (Appendix IV).

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Table 6 - Varaince Inflation Factor test reg. 2

Variable	VIF
logoffersize	1.34
logage	1.06
A/B shares dummy	1.05
Industry (HighTech dummy)	1.04
Guarantors	1.04

Table 7 - Varaince Inflation Factor test reg. 4

Variable	VIF
logoffersize	1.33
Management ownership	1.08
A/B shares dummy	1.06
logage	1.05
Industry (HighTech dummy)	1.04

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Table 8 - Varaince Inflation Factor test reg. 6

Variable	VIF
logoffersize	1.32
Management commitment dummy	1.07
logage	1.05
A/B shares dummy	1.05
Industry (HighTech dummy)	1.04

Note - The variance inflation factor test tells how much of the variance that is inflated due to multicollinearity. In a strong regression values below 10 i desired and in a weaker regression values below 4 is desired. Table 6 test for regression 2, table 7 for regression 4 and table 8 test for regression 6. The regressions are presented in table 5.

We have carried out a Breusch-Pagan test to test for heteroscedasticity. Since heteroscedasticity is detected (Appendix V), White's heteroscedasticity-consistent standard errors, i.e. robust standard errors, are used in the regressions to achieve unbiased results. Heteroscedasticity is a violation to one of the key assumptions for OLS and is common in cross-sectional data. Compensating for this with heteroscedasticity-consistent standard errors provides us with minimum squared errors for the data and generates consistent estimates of the coefficients.

A skewness and Kurtosis test is used, on relevant variables, to check for normal distributed data. A perfect normal distribution has a skewness of 0 and kurtosis of 3. As a rule of thumb, a variable in the data set is considered normal distributed if skewness is between -2 & 2 and if kurtosis is between -8 & 8. Our

results in Table 9 show that guarantors and management ownership are normally distributed, while age, offer size and prevalue contain more skew data. When using logarithmic values, the effect of outliers decreases, which makes the data more normal distributed. The results support the choice of using logarithmic values on age and offer size, which we do in our regressions. Prevalue is not used in the regressions due to multicollinearity.

Table 9 - Normality test

Variable	Skewness	Kurtosis
Guarantors	1.867	5.258
Management ownership	0.091	1.800
Age	4.758	30.252
Offersize	5.618	40.060
Prevalue	6.101	43.603

Note - Normality test is used to test for normal distributed data. A perfect normal distributed has a skewness of 0 and kurtisos of 3. The variable is considered normal distributed if the skewness is between -2 & 2 and if the kurtosis is between -8 & 8.

As the descriptive data table indicates, and the skewness tests support, our sample contains outliers. To make sure extreme values are correct we have double-checked top and bottom 5 percent of the dependent variable and the independent variables. Even so, we have also run regressions without top and bottom 2 percent of underpricing and guarantors, the two most important variables to our findings. In total, eight observations, four in each end, are removed. When running without top/bottom of underpricing the only major change is that the high-tech dummy gets insignificant. This can probably be explained by the fact that three of the four most underpriced observations are in the high-tech industry. When we remove three of 33 observations in this category, the significance changes. Furthermore, when removing the top and bottom guarantors (bottom guarantors randomly selected among observations with 0 percent guarantors), no major change is found. We believe that with the double-checking and extra regressions made, resulting in no major changes to our findings, there is no reason to remove extreme observations. Removing observations from our sample could even be misleading and decisive.

7. Conclusion

The purpose of this thesis has been to empirically test underpricing on explanatory variables on the Swedish lists Aktietorget and First North. The sample consists of 210 IPOs between 2010-2016 and the data has been hand-collected from prospectus and memorandums of association. We test three hypotheses; 1. Guarantors decrease underpricing, 2. Management ownership increase underpricing, 3. Management commitments increase underpricing.

With our hypotheses, we aimed to shed some new light on the already well-researched subject of underpricing.

Our first main conclusion is that guarantors are negatively correlated with underpricing at a 5 percent level, which supports our first hypothesis. Also, the second and the third hypothesis are found insignificant and are therefore rejected.

To the best of our knowledge guarantors is a Swedish phenomenon and we compared it to how a firm commitment contract works. Research on firm commitment contract says that in such agreements the risk is transferred from the issuer to the underwriter. When a guarantor guarantees, he takes on risk from the issuer, in the same way, to ensure that the IPO will take place. Firm commitments contracts are found to decrease underpricing in previous research, and our results show that guarantors significantly decrease underpricing. We argued that guarantors invest resources in acquiring information about the company, which will verify the IPO price. This information decrease uncertainties about the true value of the firm, thus decrease underpricing.

Previous research argue that management ownership is positively correlated with underpricing. We find no significant result on management ownership in our study, which means that the level of management ownership did not significantly affect underpricing. We find that few pre-IPO owners in companies introduced on these lists liquidate holdings in connection with the IPO, which has been found an important reason for going public on other lists. This is probably one reason for the insignificant result. Also, we believe that another reason for insignificant results is the existence of dual class shares in the offered companies. We find that dual class shares significantly decrease underpricing, supporting that superior voting control on A-shares leave less incitement for the company to underprice. A direction for future research could, therefore, be to try to offset this problem by looking at the voting rights rather than the number of shares. Looking at voting rights, one could possibly find a stronger relationship between the level of management ownership and underpricing.

We find no significant result on the dummy variable management commitments, which means that the signaling from management commitments did not significantly affect underpricing for companies in the researched sample. Previous studies find that informed investors will only invest if the true value is higher than the offer price. Therefore, the signal from management commitments should lead to an informational cascade or momentum and a triggered price. We find no such momentum and one reason for this could be the limited media coverage on smaller lists like Aktietorget and First North.

Less coverage leads to less momentum and less incitement for managers to underprice the shares. Another interesting future topic could, therefore, be to research management commitments similarly to this study but to do it on a larger and more momentum-creating list.

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Appendix

I. Guarantor comparison

<div align="center">Table 10 - IPOs and guarantors</div>

Event	Nasdaq Stockholm	Aktietorget & First North
Listings	108	369
Excluded	54	210
Used guarantors	0	50

II. Underpricing by year

<div align="center">Table 11 - Periods</div>

Year of listing	N	Mean	Median	Std. Error	Std. Deviation	95% Conf. Intervall	
2010	19	-2.6%	-1.7%	5.3%	23.0%	-13.6%	8.5%
2011	13	27.8%	2.9%	17.5%	63.1%	-10.3%	66.0%
2012	10	-3.9%	1.5%	7.2%	22.8%	-20.2%	12.4%
2013	12	28.3%	27.0%	9.8%	33.8%	6.8%	49.8%
2014	47	0.9%	-1.4%	4.1%	28.0%	-7.4%	9.1%
2015	56	17.5%	8.1%	5.6%	41.8%	6.3%	28.7%
2016	53	16.6%	3.5%	7.3%	53.2%	2.0%	31.3%
Total	210	12.0%	2.9%	2.9%	42.4%	6.2%	17.8%

III. Underpricing by list

<div align="center">Table 12 - Lists</div>

List	N	Mean	Median	Std. Error	Std. Deviation	95% Conf. Intervall	
Aktietorget	115	14.9%	3.1%	4.7%	50,0%	5.6%	24.1%
First North	95	8.5%	2.1%	3.2%	30.7%	2.2%	14.7%
Total	210	12.0%	2.9%	2.9%	42.4%	6.2%	17.8%

IV. Correlation matrices

Table 13 - Correlation matrix reg. 2

e(V)	Guarantors	logage	logoffersize	Industry (HighTech dummy)	A/B shares dummy
Guarantors	1.00				
logage	0.31	1.00			
logoffersize	-0.18	-0.25	1.00		
Industry (HighTech dummy)	0.06	0.08	-0.47	1.00	
A/B shares dummy	0.21	-0.02	0.17	-0.14	1.00

Table 14 - Correlation matrix reg. 4

e(V)	Management ownership	logage	logoffersize	Industry (HighTech dummy)	A/B shares dummy
Management ownership	1.00				
logage	-0.23	1.00			
logoffersize	0.34	-0.27	1.00		
Industry (HighTech dummy)	-0.43	0.07	-0.48	1.00	
A/B shares dummy	0.10	-0.06	0.14	-0.11	1.00

Table 15 - Correlation matrix reg. 6

e(V)	Management commitment dummy	logage	logoffersize	Industry (HighTech dummy)	A/B shares dummy
Management commitment dummy	1.00				
logage	0.29	1.00			
logoffersize	-0.32	-0.23	1.00		
Industry (HighTech dummy)	0.53	0.08	-0.39	1.00	
A/B shares dummy	-0.26	-0.07	0.12	-0.13	1.00

V. Heteroscedasticity test

Table 16 - Chi2 values for regression 2,4,6

	2	4	6
Chi2	78.51	100.48	108.57
	0.000	*0.000*	*0.000*