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IPO Underpricing in NASDAQ First North Stockholm:

Can Investors Beat the Market?

by

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ABSTRACT

Initial Public Offerings (IPOs) represent the first sale of the firms' shares to the public. By setting lower offer prices, companies going public create opportunities for investors to earn abnormal returns, making IPOs an attractive investment strategy. This is a well-known and widely discussed in academic literature the IPO underpricing phenomenon. There are different motives for the IPO underpricing as well as different factors causing positive initial returns. The purpose of this thesis is to study the IPO underpricing phenomenon in the First North Stockholm market – an alternative Nasdaq's market, specially designed for small and intensively growing firms. The thesis also aims to investigate whether the degree of IPO underpricing is influenced by the firm's age, offer size, proceeds raised, leverage, Certified Adviser reputation or industry. The sample of 83 IPOs during the period of 2009-2015 is used. The multiple regression model together with univariate regressions and general IPO underpricing formulas are applied. The results show that Swedish IPOs in the First North market are on average underpriced, indicating that investors can actually beat the market and earn abnormal returns by investing in the First North market. The further analysis of IPO influencing factors reveals that most of the chosen factors are not significant for the given sample.

Keywords: *Initial Public Offerings, IPO underpricing, Nasdaq First North Sweden, IPO influencing factors, multiple regression model.*

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1. INTRODUCTION

The excitement of buying new company's shares and earning abnormal returns makes Initial Public Offerings (IPOs) an attractive investment strategy. However, such investment strategy is often led by emotions, public excitement or the first-mover advantage rather than carefully calculated decision making. IPO is a process of private firms going public by selling their shares to a general public for the first time. Due to the high but not always rational interest of investors, newly issued shares tend to experience very high returns during the first day of trading, resulting in a positive and significant difference between the closing price and the offer price. This is a well-known and widely discussed in academic literature the IPO underpricing phenomenon. By setting lower offer prices, companies going public "leave money on the table", creating an opportunity for investors to earn abnormal returns.

One of the first researchers documenting the underpricing phenomenon were Reilly and Hatfield, who found the average initial price increase in the US new offerings of 9.9% (Reilly & Hatfield, 1969). Another pioneer Ibbotson (1975) also documented the underpricing of 11.4% for new equity issues offered to the public during the 1960s. The study of Loughran, Ritter and Rydqvist (1994) support the existence of the underpricing phenomenon in 25 analyzed countries but the level of the underpricing ranges from as low as 4.2% in France to as high as 80.3% in Malaysia.

The purpose of this research is to find out whether it is worthwhile for investors, who are interested in risky but rewarding investments, to invest in the First North Stockholm's IPO market. This paper also aims to investigate what factors influence the dynamics of IPO underpricing. In particular, thesis aims to analyse whether firms' age at the time of the IPO, offer size, proceeds (turnover of the first trading day), pre-IPO leverage ratio, reputation of the Certified Advisers (equivalent to underwriters), and finally, the industry the firm operates in have a significant effect on the level of underpricing.

There are many different motives for the IPO underpricing. According to the winner's curse hypothesis, underpricing is seen as a rational issuers' behavior to attract enough uninformed investors (Rock, 1986). Another possible explanation is the information asymmetry among investors, issuers and underwriters. Some authors claim that IPOs are more underpriced whenever the underwriter has superior information (Baron, 1982), while others argue that by gathering

additional information from investors, underwriters can actually reduce the degree of underpricing (Benveniste & Spindt, 1989). IPO underpricing can be used as a tool to induce more positive market feedback on the new issue or, on the contrary, to signal the firm's quality (Leland & Pyle, 1977; Allen & Faulhaber, 1989). Stock market conditions are also discussed as an important factor: a higher level of underpricing and higher IPO activities are both observed during the "hot issue" market periods (Ibbotson & Jaffe, 1975). Even though this phenomenon has been investigated in academic literature since the 1960s, no consensus has been reached yet.

To the best of our knowledge no academic research has so far investigated the IPO underpricing phenomenon particularly in the Nasdaq First North market. First North is an alternative market for small and growing firms, containing approximately 200 listed companies and operated by the different exchanges within Nasdaq: Stockholm, Helsinki, Copenhagen and Iceland (Nasdaq, n.d.). As the First North market is composed of small and intensively growing firms, the risk of investing in such market is considered to be higher. Due to such specific market structure, this thesis aims to analyze whether the underpricing phenomenon is present among relatively small and intensively growing companies, which may not have enough resources to carry the underpricing risks, and usually seek to raise as much capital as possible. Since more than 85% of companies listed on the First North belong to the Stockholm Securities Exchange, this market is chosen to be analysed. The time period of 2009-2015 is selected to distinguish the after-crisis trend in IPOs pricing.

The results obtained in this paper reveal that IPOs on the First North Stockholm market are on average underpriced by 4.74%, adjusting for the market returns. The highest degree of underpricing is detected within the Consumer Goods industry, where the average market-adjusted initial returns are as high as 28.20%. The lowest returns are observed for the Basic Materials sector with negative 8.89% returns. Even though the underpricing is on average confirmed for the First North Stockholm market, obtained findings fluctuate for different years, suggesting that the IPO underpricing may be a random phenomenon in this market. The obtained results from the regression analysis reveal that only one factor (proceeds) is significant in explaining the IPO underpricing in the First North Stockholm market. Other factors are found to be insignificant.

This thesis contributes to the academic society by investigating the IPO underpricing phenomenon in the Nasdaq's First North Stockholm market for the first time. Moreover, this

paper studies different factors that might positively or negatively influence the initial returns. In addition to the extensive literature review of the previous researches conducted in this field, this study collects and analyses the IPO data for the First North Stockholm market, providing useful insights on the market structure, number of IPOs over the years or IPOs for different industries.

The remaining part of this paper is organized as follows. Chapter 2 presents a more detailed literature review of the motives for firms going public, the IPO underpricing phenomenon, the summary of the main IPO underpricing theories as well as the key IPO underpricing influencing factors. Chapter 3 explains the data selection process, the choice of the main variables used in the regression analysis and the empirical research methods applied. Finally, chapter 4 discusses the main findings, limitations and future research recommendations.

2. LITERATURE REVIEW ON IPO UNDERPRICING

This chapter presents the summary of the most significant academic literature on the IPO underpricing phenomenon. At first, different motives for firms going public and issuing equity are discussed. Following, the evidence from previous researches on IPO underpricing as well as initial returns of Swedish IPOs are demonstrated. Finally, the most prominent theories on IPO underpricing and the main influencing factors are presented.

2.1. Motives for Firms Going Public

Being a milestone for a privately held firm, Initial Public Offering (IPO) represents the first sale of the firms' shares to the public. Both small and large companies have various rationalities for becoming publicly traded. There exist many historical and theoretical approaches to explain why firms go public, which do not always coincide. However, a common answer to this question is that by going public firms desire to raise equity capital (Ritter & Welch, 2002). Moreover, the authors argue that a firm conducting IPO establishes a "public market" (Ritter & Welch, 2002, p.1796), where entrepreneurs, as well as stockholders, possess an opportunity to transform their investments into money.

While Ritter and Welch (2002) are in support of the market-timing theories, serving as a motive for the number of offered shares fluctuations, in their research, the authors conclude that a firm makes a decision of going public considering not only good market conditions but also a particular stage in its life cycle. In contrast to them, Brau and Fawcett (2006) assert that market-timing is not an inducement for firms to go public. Authors find that ups and downs in IPOs trends are more dependent on founders' consideration of the industry and the whole stock market performance rather than "hot" and "cold" markets (Brau & Fawcett, 2006). Brau and Fawcett (2006) also argue that a primary motive for a firm to be listed is future acquisitions. However, the limitation of this study is that the authors conducted their research over a period of 2000-2002, which is characterized as technology bubble, making the reliability of this motive questionable.

Another determinant for going public is found by Pagano, Panetta and Zingales (1998), who confirm that one of the most influencing factors to go public is the size of a company: the larger

the company, the higher the probability of IPO. Their research was conducted on a large amount of Italian private firms, inferring that their findings could be referred to other industrial countries. However, in comparison with Benninga, Helmantel and Sarig (2005), who present tradeoff model of diversification and private benefits as an incentive for going public, Pagano et al. (1998) find no significant evidence of diversification as an influencing factor for IPOs. Nonetheless, Bodnaruk, Kandel, Massa and Simonov (2008) examine Swedish firms and find that firms with less diversified shareholders are more likely to go public. This motive is supported by an earlier finding by Chemmanur and Fulghieri (1999), according to which IPO allows for the optimal ownership dispersion.

Pagano et al. (1998) also claim that a decrease of financial leverage after exhibiting abnormal growth and investment is another significant motive for a firm being listed. Other researchers, Bancel and Mitoo (2009), by surveying Chief Financial Officers of companies over 12 European countries, whose firms went public between 1994 and 2004, find evidence that firms issue equity in order to acquire reputation and credibility, still considering financial flexibility as a driving factor for going public.

2.2. Evidence on IPO Underpricing Phenomenon

IPO underpricing is a worldwide phenomenon, which has been an object of intense debates for many years. Over many decades, IPO underpricing has been widely investigated and proved by plenty of researchers. A firm going public faces direct costs, such as initial listing fees, underwriting fees, professional fees, as well as indirect costs, commonly known as IPO price discounts. IPO underpricing, also known as the first-day return of the IPO or the initial return, refers to the fact that the offer price is lower than the first-day closing price. Consequently, IPO underpricing results in "money left on the table" (Loughran & Ritter, 2002, p.413), which is defined by the difference between the first day's closing price and the offer price, multiplied by the number of shares issued.

The significant positive difference between the first-day closing market price and the offering price was proved by numerous studies. One of the first researchers who documented underpricing were Reilly and Hatfield in 1969. They performed their research in the US market on 53 new issues listed between 1963 and 1966 and found that the average initial price increase in all new

offers was equal to 9.9 (Reilly & Hatfield, 1969). Later, McDonald and Fisher (1972) examined a sample of 142 new issues offered in the first quarter of 1969 and found that the average percent change of new issues for 1969 was three times higher than the figure obtained from the previous study by Reilly and Hatfield (1969). Another pioneer Ibbotson (1975) also documented that firms' new equity issues offered to the public during the 1960s tend to be mispriced on the first day of trading on average by 11.4%.

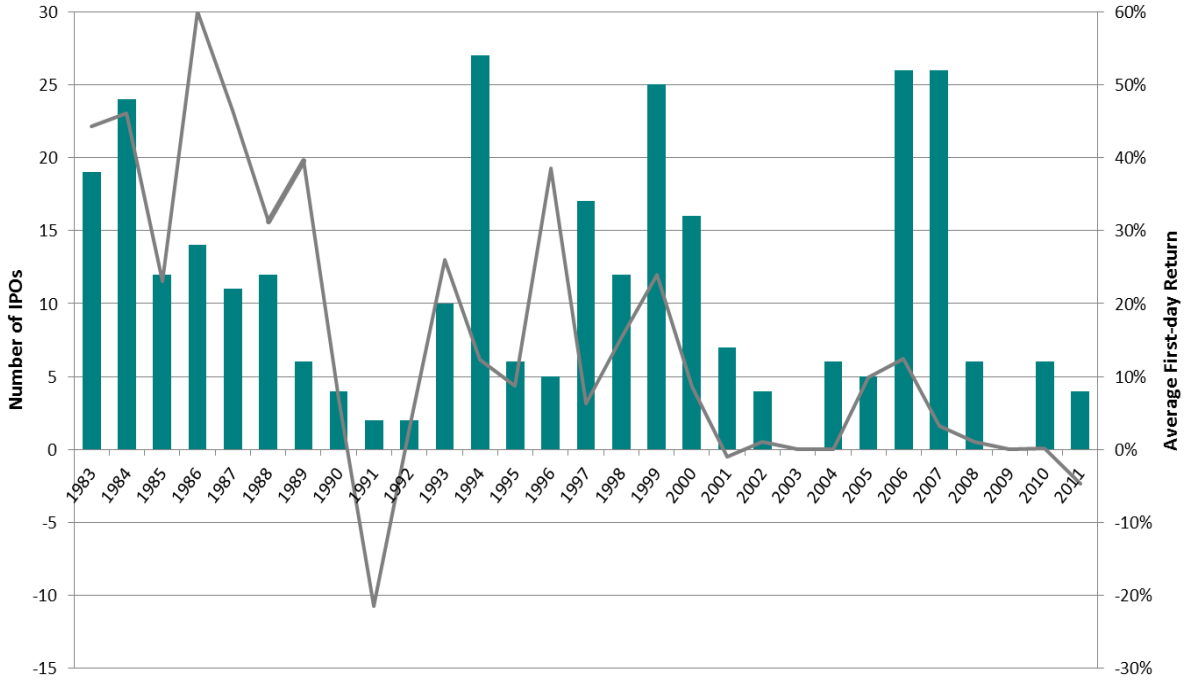
In contrast to the former researchers, Ritter (1984) compared the differences among initial returns of new issues for "hot" and "cold" markets, and concluded that hot issue markets exhibited a significantly higher level of underpricing. Findings are consistent with the later investigation by Loughran and Ritter (2004), who determined substantial differences in the level of underpricing over the subsequent years: a significant increase to 65% during the period of the "internet bubble" (Loughran & Ritter, 2004, p.5) and considerable drop to 12% between 2001-2003.

In the 1990s, scientists extended the scale of research to other countries. The study of Loughran, Ritter and Rydqvist (1994) support the existence of the underpricing phenomenon in 25 analyzed countries. However, the degree of the average abnormal returns on new issues ranges from as low as 4.2% in France to as high as 80.3% in Malaysia. In the UK the level of underpricing was found to be 12% (over the period of 1959-90 based on the sample of 2,133 IPOs), in the US the figure was 15.3% (1960-92 based on 10,626 IPOs), in Sweden 39% (1970-91 based on 213 IPOs), in Germany 10.9% (1978-92 based on 170 IPOs), in Italy 27.1% (1985-91 based on 75 IPOs), and so on. Such variation in the level of underpricing was motivated by a degree of government regulation, the timing of offers and the individual features of firms going public.

In order to investigate European firms listed between 1995 and 2004, Gajewski and Gresse (2006) conveyed a survey in 15 European countries. As a result, they found that in such countries like Germany, Greece and Finland the level of underpricing overshot the sample mean of 2,104 firms standing at 22%, while the lowest figures were detected in France and Turkey (Gajewski & Gresse, 2006). Researchers also advocated the previous studies, finding that initial returns of new issues follow a market cycle, namely tend to be higher during the "hot" market periods (Gajewski & Gresse, 2006). The reasons behind underpricing are intensively debated and result in multiple theoretical explanations, which sometimes are not proven empirically. When it comes to IPO

underpricing in Sweden, the results gathered by Jay R. Ritter (n.d.) reveal that the average first-day returns for 1983-2011 are not always positive (see Figure 1).

Figure 1. *Number of offerings and average first-day returns on Swedish IPOs*
Overall number of IPOs in Sweden between 1983 and 2011 is shown by columns with the greatest amounts of new issues observed in 1994, 2006 and 2007. The average first-day returns expressed as a percentage are represented by the line and shows that the IPO underpricing varies a lot over the years. This figure was obtained from Jay R. Ritter website, accessed on April 10, 2016 from: https://site.warrington.ufl.edu/ritter/ipo-data/.



2.3. IPO Underpricing Theories

The IPO underpricing phenomenon has been investigated in academic literature since the 1960s for various shares, stock exchanges, industries and countries. As many IPOs usually consist of young companies with limited historical financial data, it is more difficult to forecast future cash flows and apply traditional valuation techniques, such as the Discounted Cash Flow model. As a result, the estimation of the initial offer price and the overall firm value is not so straightforward and, as seen in most of the cases, lead to underpriced share value. Over the years, many theories explaining the underpricing phenomenon have developed. Further in this sub-section, the most prominent theories will be discussed, explaining why issuers and underwriters allow IPOs to be underpriced, as well as why investors are so eager to take part in the IPO process.

2.3.1. Winner's Curse Hypothesis

The tendency of the winning bid to exceed the company's intrinsic value, arising from the uncertainty and information asymmetry in the markets, is known as the winner's curse. The model was firstly introduced by Rock (1986). The author distinguished two different groups of investors: the informed ones with superior but not perfect information about the value of the company that issues or issued shares, and the uninformed investors. According to Rock (1986), the informed investors would subscribe only for the undervalued new issues and withdraw from the market when all "good" issues are gone, whereas the uninformed investors would on average bid on all issues and due to the rationing receive a smaller share of the underpriced stocks. As a result, the group of uninformed investors would get those issues that were left after the informed investors bidding because informed investors would crowd out the uninformed ones. Such setting may result in the negative returns earned by uninformed investors and consequently, discourage them from trading.

On the contrary, a weak market and informed investors reaction to the upcoming IPO would guarantee a full allotment of shares (no oversubscription) for the uninformed investors. However, such issues would most likely start trading on the lower price than initially offered and result in negative returns for uninformed investors holding a large proportion of the overpriced shares (Levis, 1990). In his paper, Thaler (1988) argues that those investors who bid at the highest prices win the auction but at the same time are "cursed" since they overpay by estimating the winning bid too high. In order to still attract the uninformed investors to the market and encourage their participation in the bidding, the underwriter would price the IPO at a discount (Rock, 1986). As a result, underpricing is seen as a rational behavior by issuers to attract enough investors for the upcoming IPO.

2.3.2. Asymmetric Information Theory

As presented by Rock (1986), IPO underpricing arises due to the information asymmetry among investors. Since there are three different parties involved in the IPO process, the issuer, the underwriter and investors, holding unequal information about the upcoming IPO, the asymmetric information problem arises. Information asymmetry occurs between the issuer and the underwriter, where the issuing firm is said to be more informed about its true value and financial

position. In addition to this, information asymmetry may also arise between the underwriter and investors. In their paper, Benveniste and Spindt (1989) investigate the IPO marketing process pursued by investment banks and find that by using the information gathered from investors underwriters can actually reduce the level of IPO underpricing. The authors argue that investors may have additional information about the issuing firm, its competitors or the market overall, and thus, have better knowledge of the true IPO value (Benveniste & Spindt, 1989). Investors tend to retain positive IPO related information up until the trading of the new issue starts, and hence, benefit from initially set lower offer price.

By modelling pre-IPO market as an auction, where investors bid for the new issue, Benveniste and Spindt (1989) claim that the underwriter can induce investors to reveal their information by correctly managing the share allocation process and as such reduce the level of IPO underpricing. Baron (1982), on the contrary, analyses the behavior between the underwriter and the issuer, and finds that the IPOs are more underpriced, whenever the underwriter has superior information about the new issue, as the issuer needs to compensate for the use of such information. The offer prices are as a result set lower whenever investment bank is more informed than the issuing firm. What is more, the underwriters usually find it less costly to price the new issue lower because this helps them to reduce the risk of possibly insufficient demand for the IPO. To conclude, the IPO underpricing is caused and influenced by information asymmetries among all three participants: the issuing firm, the underwriter and investors.

2.3.3. Market Feedback Hypothesis

According to the market feedback hypothesis, investors are assumed to be more informed and having valuable information for the pricing of the new issues. Firstly introduced by Jegadeesh, Weinstein and Welch (1993), market feedback was used to explain the rationale behind the seasoned equity offerings (SEOs), where firms with a higher degree of IPO underpricing were found to exercise more and larger SEOs. In general, managers can motivate the investors to reveal their information by issuing a larger number of shares at lower prices (Bommel, 2002). Such actions would lead to higher level of underpricing. At the same time, too low offer prices would attract a higher amount of uninformed investors and in the end decrease the amount of useful information gathered (Bommel, 2002). Nevertheless, a higher number of investors, whether uninformed or informed, would increase the probability of successful IPO.

The market feedback hypothesis is also used to explain the best-effort IPO concept. The best-effort IPO usually indicates both, the minimum and the maximum number of shares to be sold, therefore, the exact amount of money raised from the IPO reflects the true market opinion about the stock (Bommel, 2002). Bommel (2002, p. 124) concludes: "To induce ex-post feedback of higher quality, issuers ex ante underprice their shares". Therefore, issuers use underpricing as a tool to stimulate more positive market feedback.

2.3.4. Signaling Theory

According to the signaling theory, the IPO underpricing may be used as a signal of the company's quality and high value to its' future investors. Since there is an information asymmetry between the issuer and investors, with issuing firm being more informed about the possible future cash flows and the overall firm's financial situation, the issuer can signal its' quality by setting a lower offer price or by retaining some part of the initial offer shares in the personal portfolio (Leland & Pyle, 1977; Grinblatt & Hwang, 1989). In their paper, Leland and Pyle (1977) emphasize only one signal – issuers' willingness to invest in its' own business by retaining part of the ownership. According to the authors, good-quality projects tend to have higher costs and may not be undertaken, given the overall low quality of the projects available in the market, therefore, to receive financing for good-quality issues, it is necessary to signal their credibility to the public (Leland & Pyle, 1977). One of the recommended ways to signal quality is to retain some part of the ownership.

Grinblatt and Hwang (1989) introduce additional signal, the offer price, and find a positive relationship between the level of underpricing and the firm's true value, given the variance of the firm. Underpricing is seen as a positive signal since only high-quality firms can afford lower initial offering prices because they are able to recoup the costs of such signal later on (Allen & Faulhaber, 1989; Welch, 1989). Low-quality companies, on the contrary, are not able to pay for the signal and would either restrain from going public or underperform in the aftermarket or even go bankrupt. According to the signaling theory, IPO underpricing is seen as a positive signal of the company's intrinsic value. In addition to this, other signals are found that may help to distinguish whether it is worthy to invest in the IPO or not. To name few, Grinblatt and Hwang (1989) list managers' decision to work with highly priced top-tier investment banks, offer high dividends to shareholders, use extensive advertising or retain a significant part of the ownership.

2.3.5. Hot Issue Markets Theory

Defined as the periods, where the average first-month returns of new issues are abnormally high, hot issue market concept was firstly discussed by Ibbotson and Jaffe (1975). The main findings of the hot issues theory suggest that the IPO market is cyclical: periods of very high returns are followed by the periods of low returns. Ibbotson and Jaffe (1975) find that the series of the first month's residuals do not follow a random walk, meaning that they are predictable and can be estimated to help investors distinguish the hot issue months with high expected returns. Ritter and Welch (2002) also suggest that the overall market performance, whether it is "hot" or "cold", is one of the most important factors influencing companies' decisions to go public, with significantly higher number of IPOs in the hot market periods.

At the same time, the predictability of hot issue markets assist the issuers in determining their offer prices, with the tendency of lower offering prices in hot issue markets (Ibbotson & Jaffe, 1975). The lower the offer price, the higher the possibility to observe higher closing price at the end of the first trading day and thus experience the IPO underpricing. As a result, hot issue market periods tend to experience higher IPO activity with more firms going public as well as higher IPO underpricing possibility.

Ritter (1984) analyses such hot issue market (15-month period between 1980-1981) and finds that the average return on the first trading day was as high as 48.8% during this period of time, while during the remaining period between 1977-1982, new issues were underpriced only at 16.3%, corresponding to the cold market concept. These results represent only one example of hot issue markets. This phenomenon has been widely discussed in financial industry and gives important recommendations for investors willing to beat the market – invest in the IPOs during the hot market periods, where IPOs are predicted to be even more underpriced.

2.3.6. Windows of Opportunity Hypothesis

Periods, when investors are highly optimistic about the future growth of firms going public and when the demand for shares increases, are known as the windows of opportunity. Companies going public can take an advantage of such favourable timing and issue their equity overvalued (Jarrow, Maksimovic & Ziemba, 1995). However, shares issued during the windows of opportunity tend to perform poorly in the long-run (Jarrow et al., 1995). Ritter (1991) proves that

when the periods with the unusually high volume of conducted IPOs are associated with the poor long-run performance of these IPOs, it indicates that the IPOs were issued under the windows of opportunity condition. What is more, IPOs conducted during such periods tend to have a higher level of underpricing. Thus, when the market sentiment and investors' optimism increases, IPOs tend to be more underpriced.

2.3.7. Bandwagon Effect Hypothesis.

The bandwagon effect, also known as informational cascades, is a phenomenon, where people behave in a way others do, regardless of their own beliefs and attitudes. Bikhchandani, Hirshleifer and Welch (1992) claim that there exist an infinite number of situations where it is optimal for individuals to follow the mass behavior, IPO market being one of them. During the pre-IPO phase, the underwriter may intentionally underprice new issues to attract initial investors, create some buzz in the market, which then would induce the bandwagon to form. Shefrin (2002) points out two reasons causing the bandwagon effect, namely the belief that the general crowd must know something about the upcoming IPO, and the knowing that in case of unsuccessful investment, all investors would equally experience the loss. According to Welch (1992), if sufficiently many investors apply early for an IPO, all subsequent individuals would follow their behavior. Accordingly, slow initial sales would discourage other potential investors. To avoid the negative bandwagon effect, underwriters tend to underprice their IPOs to attract as many investors in the initial stage as possible.

2.3.8. Prospect Theory

Prospect theory is part of the behavior economics studies and describes the choice methods under uncertainty. This theory focuses on wealth, assumes loss aversion, and incorporates framing, meaning that individuals have a choice of treating two events either separately (segregation) or as one (integration) (Ritter, 2003). Prospect theory is useful in explaining why issuers accept leaving money on the table by underpricing their IPOs. According to Loughran and Ritter (2002), issuers integrate the good news of their increased wealth, due to higher than previously expected IPO price on the first trading day, with the bad news of excessive dilution, making pre-issue shareholders worse off due to the underpricing. Hence, prospect theory argues that issuers tend to sum up their total wealth: loss from money left on the table with gains from higher stock prices

after IPO. Those pre-issue shareholders who leave a lot of money on the table at the same time benefit from underpricing as the stock prices raise more than initially anticipated (Loughran & Ritter, 2002). Interestingly, those IPOs, where the offer prices were increased just a little bit, are actually the ones losing more, when the trading starts and the market prices go up (Ritter, 2003). This phenomenon may explain why underwriters slightly underprice their IPOs.

2.4. Factors Influencing IPO Underpricing

2.4.1. Firm Age

Various firms make a decision to go public at a different stage of their life. It is common that younger companies tend to be riskier and logically investors, who are uncertain about the future of such companies, would demand higher returns from these firms. Ritter (1984) argues that informational friction regarding the true value of IPO goes in parallel with the increase in costs related to the information gathering due to limited availability of a firm's historical data. Therefore, informed investors require a greater discount on the price of new issues. This is consistent with uncertainty determinant of underpricing suggested by Beatty and Ritter (1986), who find a positive relationship between these two variables, inferring that the higher the firm age, the lower the degree of underpricing. In 2003, Ljungqvist and Wilhelm, in order to analyze pricing behavior of IPOs between 1996 and 2000, included age factor of a firm into the line of variables describing individual characteristics of a company: the significant relationship between these two measures is once again detected.

2.4.2. Offer Size

IPO offer size is measured by the number of shares offered times the offer price. This factor is often used as a proxy for the firm size. Numerous studies found an inverse relationship between the level of IPO underpricing and the offer size. Beatty and Ritter (1986) argue that the offer size is an approximation for ex-ante uncertainty, inferring that smaller offerings, being an indication of risk, have higher initial returns. The result of their findings was enhanced by Miller and Reilly (1987), who found that the extent of initial returns of IPOs is positively and significantly correlated with ex-ante uncertainty. Conducting the test on the underpriced and overpriced subgroups separately produced a supplementary proof for the argument (Miller & Reilly, 1987).

Ljungqvist (1997) also found an inverse and significant relation between the underpricing and the offer size, also considering uncertainty as a driving factor. On the other hand, some studies found that the offer size does not have a significant influence on IPOs initial returns. For example, Booth and Chua (1996) argue that there is an absence of a statistically significant relationship between the offer size and the underpricing, although the correlation between these two measures is found to be negative as expected.

2.4.3. Proceeds (Turnover)

Proceeds (turnover) generally refer to the actual amount of money raised from new issues realization. There exist several studies explaining the relationship between the turnover and the extent of underpricing. Yüksel and Yüksel (2006) performed research on the newly issued shares listed on the Istanbul Stock Exchange between 1990 and 2002 and found a significant positive relationship between the extent of underpricing and the turnover. Authors refer to turnover as an indicator of the "trading activity" (Yüksel &Yüksel, 2006). Being consistent with Ritter (1984), Rock (1986), Beatty and Ritter (1986), authors also refer to the informational friction among market participants as a primary factor positively influencing the underpricing level. In addition to this, Yüksel and Yüksel (2006) argue that in the short-term the underpricing extent is proportionally related to the proceeds raised through the sale of the new shares while supporting the lack of such relationship in the long-term. The positive relationship between the first-day return and the proceeds was also detected by Loughran and Ritter (2004), who analysed IPOs over1980 - 2003. In contrast to findings from the research on the US market, the authors argue that this relationship is asymmetric, meaning that for the underpriced issues, the IPOs initial return is not significantly correlated with the turnover, whilst detecting a negative relationship concerning the overpriced shares (Yüksel & Yüksel, 2006).

2.4.4. Leverage

In corporate finance theory, a reasonable proportion of debt to equity is an indicator of the firm's financial quality. A high or low degree of leverage also conveys information to the market. Managers of the firms with a high degree of leverage have greater budget constraints and are less exposed to the distortion of the firm's cash flows. Therefore, such signal through leverage may influence investors' perception of the firm value. According to James and Wier (1990), a firm

exhibiting credit relationship before going public has lower underpricing, indicating that the initial return of new issues and leverage are inversely related. They explain this fact in terms of the information asymmetry since a firm, having existing bank loans before offering stocks to the public, makes investors' uncertainty about its market value lower. Another evidence of underpricing dependency on leverage was found by Cai, Ramchand and Warga (2004), who compared initial returns of stock offerings for two groups of companies, namely, those which issued debt before going public and those which did not. The outcome of the research was consistent with the expectations: an inverse relationship between the underpricing and the leverage was detected, still considering information asymmetry as an essential determinant of such relationship. Moreover, authors assert that lower underpricing for firms with prior debt could be explained by the fact that such firms are larger, older and exhibit less risk, meaning that have more solid financial history (Cai et al., 2004).

2.4.5. Underwriter Reputation

A comprehensive literature on the IPOs short-term performance reveals that the underwriter reputation is negatively related to the initial returns of new stock issues. Carter and Manaster (1990) assert that, assuming the market participants are aware of the underwriters' prestige, low-risk firms tend to conclude an agreement with more reputable underwriters in order to make the market informed about the low risk of their issues. Consequently, by reducing information asymmetry, underwriters play a signaling role about the true value of a company.

Carter and Manaster (1990) determine a significant negative relationship between the reputation of the underwriter and the level of IPO underpricing. Being consistent with them, Michaely and Shaw (1994) as well as Megginson and Weiss (1991) find evidence that the initial return of newly issued equity is negatively related to the underwriter prestige, however, as a measure of the latter, they use relative market share of the underwriter: the higher the share, the greater the quality of the underwriter. However, Carter, Dark and Singh (1998) argue that only the method applied by Carter and Manaster, which is called the "tombstone announcement" (Carter & Manaster, 1990, p.1054) – prestige ranking system as an approximation of underwriter's reputation, generates statistically significant result explaining the abnormal initial return of IPOs.

Nonetheless, some researchers found a positive relationship between the underwriter reputation and the level of underpricing, providing different explanations for this phenomenon. For instance, Ljunqgvist (1999), who analysed the 1980s and the 1990s IPOs, postulate that one possible reason for a positive relationship could be conflicts of interest between entrepreneurs and their venture backers, while Beatty and Welch (1996) explain this based on the differences in the economic environment.

2.4.6. Industry

Plenty of research found that IPO underpricing is an increasing function of ex-ante uncertainty of the issue. One of the determinants of the uncertainty is the riskiness of the industry the firm operates in. The influence of industry-specific risks on the level of IPO underpricing was proved by several researchers. Ritter (1991) investigated 1,526 IPOs over 1975-1984 belonging to 14 different industries and found the highest level of initial returns of 128.21% in Financial Institutions sector, closely followed by Drugs sector at 121.69%, while the lowest figure was detected in Wholesales industry having a negligible 1.42%. Loughran and Ritter (2004) analysed the US IPO market between 1990 and 2003 and discovered that during the information technology bubble there was a significant increase to 65% in the level of underpricing while in the post-bubble period it dropped to 12%.This phenomenon is explained by the fact that technology firms are likely to be younger, and consequently, investors who are exposed to such additional risk need to be compensated. High level of tech-stock initial returns was also highlighted by Arosio, Guidici and Paleari (2000), who made a research on the internet stock IPOs listed on the "Euro's secondary Stock Exchanges" from 1999 to 2000, and found an initial average return equal to 76.43%. Arosio, Guidici and Paleari (2000) relate this to overoptimistic expectations of investors regarding firm's prospects as well as public and private information obtained during the new issues offering. Later, Daily, Certo and Dalton (2005), in their analysis of factors influencing IPOs performance considered risky firms and classified industries in two categories, namely "high-technology" and "low-technology" companies. A significant relationship between the underpricing and "high-technology" firms was detected.

3. METHODOLOGY

This chapter describes the methods used to estimate IPO underpricing in Nasdaq First North Stockholm market. The chapter starts with the explanation of the research design and approach. Then, the choice of the stock market, data collection process as well as final sample size are presented. Furthermore, the regression model is explained in details, including descriptions of the dependent and independent variables, constructed hypotheses, multiple regression equation and the OLS model assumptions. The chapter concludes with the discussion of this research reliability and validity.

3.1. Research Approach and Design

In this thesis, a deductive reasoning is used to conduct the research. Deductive approach starts with the analysis of the general theories related to the subject. Then, based on the previous studies, hypotheses are formed to investigate whether there is a significant relationship between two or more variables. Finally, hypotheses are tested empirically using a particular data sample and statistical methods. According to deductive research approach, hypotheses are formed and tested prior rejecting or confirming the projected relationship.

This thesis begins with the analysis of the most prominent theories on IPO underpricing and underpricing influencing factors. Based on the conducted literature review, hypotheses are formed to examine if there exists a significant relationship between the IPO underpricing and selected factors. The degree of underpricing is examined for a particular data sample – IPOs in Nasdaq First North Stockholm market for the period of 2009-2015. When the data collection process is finished and hypotheses are tested empirically, confirmation or rejection of the proposed theories is made.

There are various types of research designs and different frameworks to conduct the study. Exploratory research looks for potential relationships between variables without having a specific hypothesis beforehand and as such is often useful in making new discoveries. Here the researcher aims to minimize the probability of rejection as much as possible by setting the significance level lower. As a result, this type of research is designed to minimize the type II error – a failure to detect the effect that is present (Jaeger & Halliday, 1998). Descriptive research is used to describe

a particular phenomenon, situation or a problem but does not intend to answer any specific question on why or how the particular events happen.

Confirmatory research, also known as hypothesis testing, is used to examine a specific relationship between two variables, where hypotheses are derived a priori based on the previous studies. This type of research strives to reduce the probability of detecting the results that are not present, or in other words, reporting a non-significant result as significant, which is known as a type I error (Jaeger & Halliday, 1998). In this thesis, a confirmatory research design together with quantitative data analysis is applied.

3.2. Data

3.2.1. Choice of the Market

Nasdaq First North Stockholm was chosen to be analysed in this thesis. First North is a specially designed Nasdaq's European market for relatively small and growing companies. Firms listed on this market may not have enough resources to carry the underpricing risks and tend to raise as much capital as possible. Therefore, it is interesting to investigate the IPO underpricing phenomenon for this market. The risk of investing in shares listed on such market is also considered to be higher compared to the main Nasdaq market since First North has no legal status as an EU-regulated market (Nasdaq, n.d.). First North gives listed companies access to all the benefits of being public at the same time offering easier listing process, lower admission requirements and less regulation (Nasdaq, n.d.). As more than 85% of companies listed on this market belong to the Stockholm Securities Exchange, particularly First North Stockholm is chosen in this thesis.

3.2.2. Data Collection

The data for this thesis was collected from different secondary sources. At the beginning, the list of new companies listed on the First North during the period of 2009-2015 was extracted from the Nasdaq's webpage. Exact listing date and the industry the company operates in were also obtained from this website. Only the IPOs in Stockholm market were included in the final sample. Historical first-day closing prices and trading turnover (proceeds) were collected from

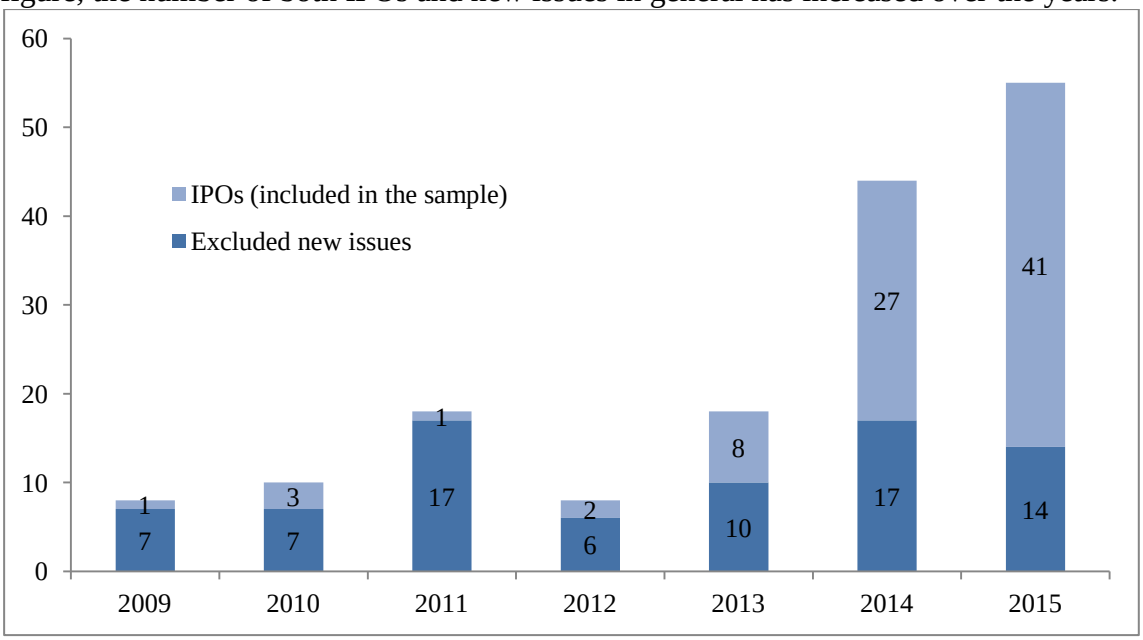
the Nasdaq's web page as well. Turnover, in this case, represents the amount of money raised during the process of IPO. Information on the offer size, which is simply the offer price multiplied by the number of shares initially offered, was collected from IPO prospectuses or a special website for new issues in Sweden (*www.nyemissioner.se*). Firms' websites, press releases or general search engines were also used to obtain the missing information. Date of incorporation of the firm issuing new equity was used to calculate its age (date of establishment was subtracted from the date of IPO). Finally, the leverage ratios for each firm conducting IPO were collected from the Thomson Reuters Datastream.

In addition to this, the list of Certified Advisers (CAs) for each firm was obtained from Nasdaq's website. The main role of Certified Advisers is to guide the firms through their IPO process. CAs are also responsible for providing support and ensuring that the companies meet the requirements associated with having their shares traded on First North (Nasdaq, n.d.). CAs are special entities similar to underwriters but observable only on the First North market. Based on conducted literature review, underwriter's reputation is mentioned as one of the possible IPO underpricing influencing factors. In this thesis, Certified Advisers' reputation is used instead. The reputation scores are assigned based on the total number of deals made during the period of 2004-2015. In particular, each CA is assigned a percentage market share by dividing the number of companies advised by the total number of deals on Nasdaq First North Stockholm market. In this case, all new issues are taken into account, including switches from the other markets, secondary listings, spin-offs, reversed takeovers, etc.

3.2.3. Sample Size

In total, 161 new issues on the First North Stockholm market appeared during the period of 2009-2015. However, only 83 firms are included in the final sample. The time period of 2009-2015 was selected to distinguish the after-crisis effect of IPOs initial returns. The amount of new issues differs year by year, with the highest number of IPOs and new issues in 2015, followed by 2014. The total number of new issues by year and the IPOs included in the sample are presented below in Figure 2.

Figure 2. *Total new issues on First North Stockholm market*
This figure is based on the total number of new issues (161 firms) for the Nasdaq First North Stockholm market between 2009 and 2015, of which 78 companies are excluded from the sample for the given period of time since only pure IPOs are considered. As seen from the figure, the number of both IPOs and new issues in general has increased over the years.



Some of the firms were excluded from the sample because they switched from the other markets (e.g. Aktietorget, Nasdaq's Main Market, NGM Equity, Nordic MTF, London AIM, etc.), had secondary or dual listings, spin-offs, reversed takeovers and as such are not considered "pure" IPOs. In addition to this, eleven companies were excluded due to the missing information for the exact offer prices, closing prices or the size of the offer. Most of such firms were delisted, ended trading, switched to the main market, and hence, historical prices could not be found. The spread of different reasons for exclusion from the sample is shown in Figure 3.

The companies included in the sample are classified to eight different industries. Out of 83 firms included in the sample, the highest numbers belong to Financials, Industrials and Health Care industries. The spread of companies by industry are shown in Figure 4.

Figure 3. *Reasons for exclusion from the sample*

This figure shows the reasons why some of the companies issuing equity on the First North Stockholm market were excluded from the sample. All 78 firms excluded are categorized by different reasons for exclusion, with the most common one being switches from the other stock exchanges(36 firms), spin-offs (11) and due to the missing observations (11).

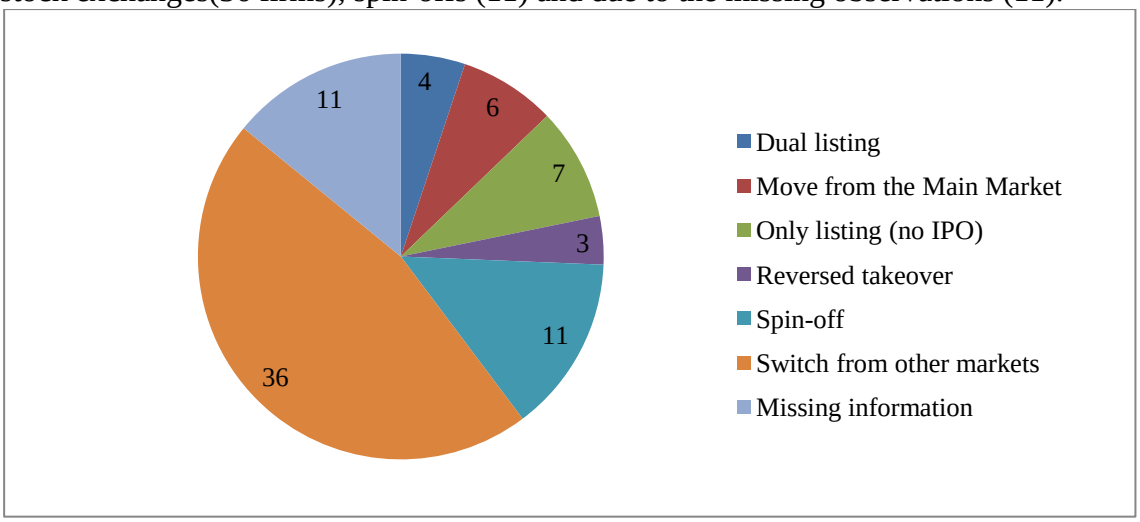
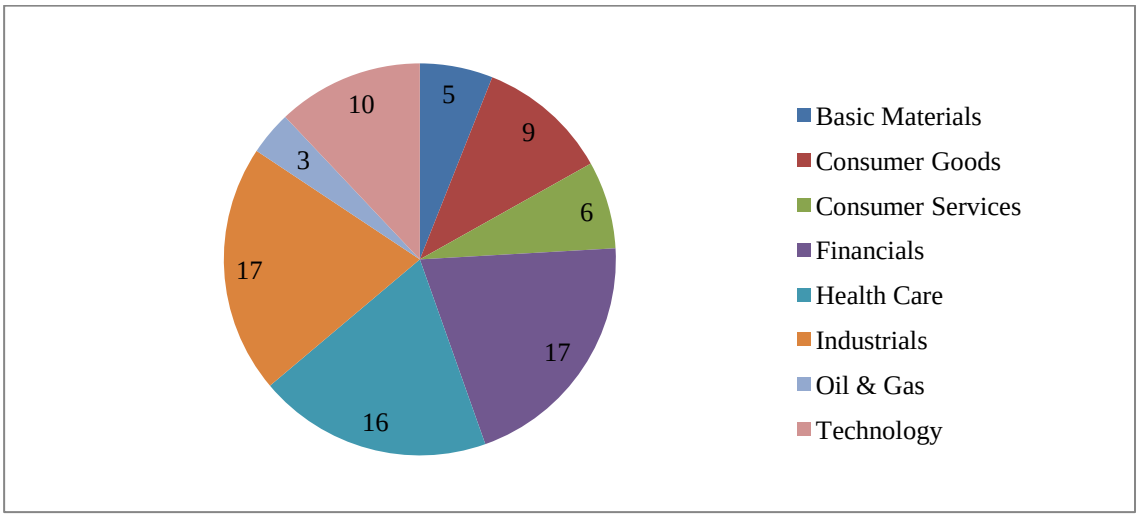


Figure 4. *Number of IPOs by industry*

This figure represents the sample of 83 firms classified by different industries. Particularly, companies that issued new equity on the First North Stockholm market belong to eight different industries. Most of the IPOs included in the sample belong to Financials, Industrials and Health Care sectors.



3.3. Regression Model

In order to determine the relationship between the IPO underpricing and the factors influencing this behavior, a linear regression model analysis is carried out based on the sample described before. Linear regression analysis is the most popular statistical technique used in the IPO underpricing analysis by the previous researchers.

3.3.1. Dependent Variable

As the study aims to determine the relationship between the magnitude of underpricing and the factors influencing this phenomenon, the level of underpricing is used as an explained variable in the regression analysis. The underpricing phenomenon is defined by the positive first-day return, otherwise, the stocks are overpriced. As previously defined, IPO underpricing or the first-day return is mathematically measured as the percentage difference between the offer price and the closing price of the first trading day. The formula used in this thesis to calculate initial returns is based on Ritter (1991) approach. The initial return (IR) for each firm is calculated by the following formula:

$$IR = \frac{Closing\ Price - \ Offer\ Price}{Offer\ Price}$$

However, the initial returns need to be adjusted to account for the general market movements. Fluctuations of the stock market may positively or negatively influence the level of underpricing resulting in different initial returns. To do so, daily returns of OMX Stockholm 30 Index (OMXS30) are subtracted from the previous formula. OMXS30 is chosen as a benchmark because it is the Stockholm Stock Exchange's leading share index, consisting of the 30 most actively traded stocks and is often used for benchmarking as it gives a clear demonstration of the Stockholm stock market's movements (Nasdaq, n.d.). The formula for market-adjusted initial returns (MAIR), which was introduced and used by Logue (1973), is given below:

$$MAIR = \frac{Closing\ Price - \ Offer\ Price}{Offer\ Price} - \frac{OMXS30\ Closing\ Value - \ OMXS30\ Opening\ Value}{OMS30\ Closing\ Value}$$

This method corrects the simple initial returns by subtracting the returns of a relevant stock market index for the same period.

3.3.2. Independent Variables and Hypotheses

Variables stated below are used to demonstrate the relationship between the market-adjusted initial returns and factors influencing underpricing. A detailed description of each of the factors and the application of them in the previous studies is provided in the section 2.4. of this thesis. The hypotheses presented below, which are later on tested empirically using a multiple regression model, are constructed based on the previous research.

Firm Age. The operating history of a firm is consistent with ex-ante uncertainty. Information asymmetry should decrease with the increase in the firm age. As a proxy of a firm age, the natural logarithm of the number of years between the year of the company's establishment and the IPO date is applied. Since some of the firms go public within the establishment year and since the natural logarithm of zero is undefined, one is added to the age of the company. This method is also consistent with the way Ritter (1991) treats the age variable.

$$Firm\ Age = \ln\left(1 + (Year_{IPO} - Year_0)\right)$$

Hypothesis 1:

There is a negative relationship between the Age of the firm and the degree of the IPO underpricing.

Offer Size. Offer size, measured as the number of offered shares multiplied by the offer price, serves as another explanatory variable. Since larger IPOs tend to be offered by more established firms and are generally easier to be valued, as they are related to the lower ex-ante uncertainty, the coefficient is expected to be negative (Ljungqvist, 1997). The natural logarithm transformation of the variable is used in the regression.

Hypothesis 2:

There is a negative relationship between the Offer Size and the degree of the IPO underpricing.

Proceeds (Turnover). To assess the impact of proceeds, which represents total revenue raised from the introduction of the new issues to the market, on the level of IPO underpricing, first-day trading turnover is used. A positive relationship between these two measures is expected based on findings of Loughran and Ritter (2004) as well as Yüksel and Yüksel (2006). The natural logarithm value of the variable is used in the regression.

Hypothesis 3:

There is a positive relationship between the Turnover and the degree of the IPO underpricing.

Leverage. This is the ratio of Total Debt as of the end of the fiscal year to Common Shareholders' Equity for the same period and is expressed as a percentage. The value is taken as one year before the company went public, which is consistent with the approach used by Leone, Rock and Willenborg (2007).

Hypothesis 4:

There is a negative relationship between the Leverage and the degree of the IPO underpricing.

Certified Adviser Reputation. As a proxy for a Certified Adviser (CA) reputation, market share of the adviser is applied. The higher the CA reputation, the lower the level of IPO underpricing is expected to be. CA's reputation is associated with lower risk offerings inferring lower initial returns. The market share for each CA engaged in the listing process on Nasdaq First North Stockholm market is calculated by the following formula:

$$CA\ market\ share = \frac{Number\ of\ deals\ conducted\ by\ a\ particular\ CA}{Total\ number\ of\ deals\ over\ 2004-2015}$$

Hypothesis 5:

There is a negative relationship between the Certified Adviser Reputation and the degree of the IPO underpricing.

Industry. A dummy variable approach is applied to differentiate the industry. The dummy variable takes a value of one if the firm belongs to a risky industry and zero otherwise. The dummy approach was also applied by Loughran and Ritter (2004), Daily et al. (2005), and others. The inclusion of the Technology dummy, which takes the value of one if the firm belongs to the Technology industry and zero otherwise, is based on the empirical findings that high-tech industry is more risky, resulting in higher uncertainty and higher level of IPO underpricing.

Hypothesis 6:

The degree of the IPO underpricing is higher in the Technology industry.

3.3.3. Multiple Regression Model

In order to investigate the combined effect of the factors influencing the level of IPO underpricing, multiple regression is performed with the market-adjusted initial return as a dependent variable and the explanatory variables described above as the regressors. Multiple regression model helps to determine which of the independent variables affect the response variable more and what is the direction of the influence.

$$MAIR_i = \beta_0 + \beta_1 \, ln(Age_i) + \beta_2 \, ln(Offer\_Size_i) + \beta_3 \, ln(Proceeds_i) + \beta_4 Leverage_i + \beta_5 CA_i + \beta_6 Industry_i + \varepsilon_i$$

Ordinary least squares (OLS) model is used to explain the relationship between the dependent and independent variables. In the interest of testing the correlation between the market-adjusted initial return and regressors, multiple regression model and various statistical tests are conducted on the EViews software Version 8.1 in order to ensure the robustness of the model.

3.3.4. OLS Violations

In order to establish a valid regression model, several potential violations of the Classical Linear Regression Model (CLRM) should be examined (Brooks, 2014). Since this study is based on the cross-sectional data analysis but not time-series data, for using the OLS method in the estimation of the regression potential multicollinearity, heteroscedasticity, non-normality and non-linearity problems are considered and relevant remedies applied.

Multicollinearity. Multicollinearity occurs when two or more explanatory variables in the multiple regression are correlated with each other. It is often accepted that there is a small degree of correlation between the regressors, however, if this relationship is significant, the statistical power of the analysis decreases. In order to determine the relationship between the independent variables, the correlation matrix is created. According to the rule of thumb, if the correlation coefficient is greater than 0.8, there is a presence of severe multicollinearity. Several consequences may arise because of the multicollinearity issue. For example, despite the fact that regression has a high fit of the model (high R^2), estimates exhibit high standard errors. This results in difficulties in interpretation of which of the explanatory variables affect the response variable more since they are correlated (Brooks, 2014).

Heteroscedasticity. Being one of the requirements for a statistical analysis, homoscedasticity means that the variance of the error terms is constant, otherwise, there is a presence of heteroscedasticity (Brooks, 2014). This is a widespread concern for many regression models and it may cause a misleading conclusion regarding the model if the problem is not alleviated. OLS estimation still generates unbiased regressors' coefficients, however, they cannot be considered best linear unbiased estimators (BLUE) anymore (Brooks, 2014). Therefore, it is advised to examine the model residuals. In this study, White's heteroscedasticity test is applied in order to check whether the errors of the variables have constant variance. If the heteroscedasticity is detected, White's heteroscedasticity - consistent standard error estimates can be applied to the model as such modification of the explanatory variables' standard errors alleviates the heteroscedasticity problem.

Non-normality. Normality assumption says that the error terms of the regression should be normally distributed. If the residuals are normally distributed, they have the skewness of zero, meaning that there is a symmetric distribution, and the kurtosis of three, which is a descriptor of the tails' shape of the distribution (Brooks, 2014). The Jarque-Bera test is the most common test for the normality, which determines whether the coefficients for the skewness and excess kurtosis are jointly equal to zero (Brooks, 2014).

Non-linearity. Linearity predicts that the dependent variable is a linear function of each of the explanatory variables, meaning that this relationship can be depicted by a straight line (Brooks, 2014). Ramsey's RESET test is a general test of functional misspecification and intends to detect whether non-linearity exists in the model. If the null hypothesis of linearity is rejected, a possible remedy for the problem is to determine the variable causing non-linearity and include a higher-order power of this variable into the regression (Brooks, 2014).

3.4. Research Reliability and Validity

Research reliability refers to the extent the results of a particular study are consistent and can be inherently repeatable by other researchers. The obtained significant results should not be one-off findings but generate similar results under the same assumptions but using different data sample. Research reliability is related to possible errors in data, which might be caused by different data gathering processes. The data collected should be valid and obtained from reliable sources.

In this thesis, all data was collected from reputable sources (for detailed descriptions of data collection please see the sub-section 3.2.2.). As the list of new issues provided by Nasdaq includes not only IPOs but also other types of issues, verifications for each new issue were performed manually. Hence, there might be potential errors in data caused by incorrectly excluding or including some firms. To minimize such risks, all IPOs were re-confirmed with the information provided in the Nasdaq's surveillance reports and by checking press releases, IPO prospectuses and other reliable internet sites. Other possible errors in data might be caused by the fact that all data inputs were processed manually. As the sample size is relatively large, there is a probability of a human error. In addition to this, some IPOs were excluded from the sample due to the missing information, which might cause biased results. Even though there is a possibility of the errors in data, all the data was carefully collected to make sure such risk is minimized.

Research validity refers to the entire scientific model, whether obtained findings meet all the necessary requirements of social research methods. Validity covers different research aspects, such as random sample selection, internal and external validity, as well as dealing with unknown factors, which might influence final results. Research validity is often linked to the possible errors in models. Certain assumptions need to be met when constructing the model. As the model is only an approximation of the reality, there is always a risk of lost information due to the simplifications made in the model.

The model presented in this thesis and the formula used to calculate IPO underpricing is based on previous academic literature. The most common way to measure underpricing is by taking the difference between the offer price and the first-day closing price, and this method is applied in this paper. However, a possible error in the model might be caused by the market returns adjustment. Using different market return indexes might lead to different inferences. What is more, there are many factors which could influence IPO underpricing, however, only few of them are included in the model. The restricted number of influencing factors might limit the scope of the research and the obtained results. Finally, if some of the OLS assumptions are violated, the findings might still be valid but not BLUE.

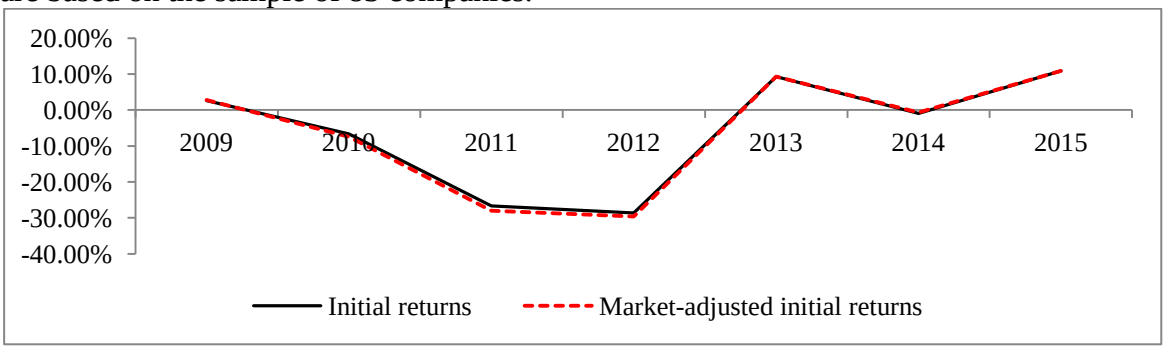
4. RESULTS AND RECOMMENDATIONS

In this chapter, the main results and findings on IPO underpricing phenomenon as well as underpricing influencing factors are presented. The chapter begins with the analysis of the level of IPO underpricing in Nasdaq First North Stockholm market. The findings are presented both by years and by different industries. Next, descriptive statistics of the sample, statistical tests and regression results are discussed. Finally, research limitations, as well as future research recommendations, are considered.

4.1. The Degree of IPO Underpricing

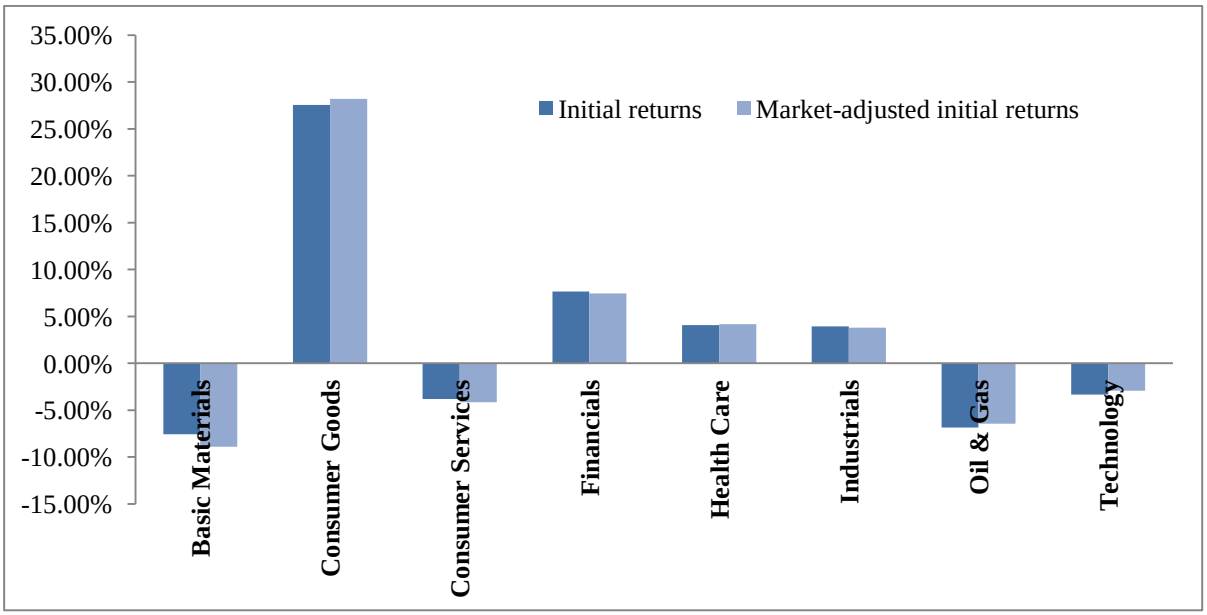
Based on the sample of 83 firms, the average underpricing for Nasdaq First North Stockholm market for the period of 2009-2015 is 4.77%. Market-adjusted initial returns are 4.74% respectively. The highest ever market-adjusted initial return of 95.40% was observed in 2014 for a company which belongs to the Financials sector. The lowest return correspondingly was also observed in 2014.The new issue of shares of a technology company was overpriced by 56.52% in the given year. Looking at the average initial returns year by year, one can conclude that the IPO underpricing phenomenon is not necessarily observed every year. For instance, in 2010, 2011, 2012 and 2014, the shares on average appeared to be overpriced with negative initial returns (see Figure 4). As a result, underpricing in this particular market might be a random phenomenon rather that a definite finding.

Figure 5. *Average yearly underpricing in First North Stockholm market*
The figure demonstrates the average initial returns as well as market-adjusted initial returns for firms listed on the First North Stockholm market for the period of 2009-2015. The results are based on the sample of 83 companies.



The results of IPO underpricing by different industries for the sample used in this thesis reveal that on average the highest initial returns are observed for firms belonging to the Consumer Goods sector, where market-adjusted initial returns are as high as 28.20% for the period of 2009-2015. Consequently, the lowest initial returns appeared to be for companies operating in the Basic Materials industry with market-adjusted initial returns of -8.89% for the given period. Overall, firms issuing equity and belonging to the sectors such as Consumer Goods, Financials, Health Care or Industrials, on average have positive returns after the first-day of trading, while companies operating in the Basic Materials, Oil and Gas, Consumer Services or Technology industries tend to have negative initial returns. Interestingly, the shares of technology companies on average are overpriced, according to the sample used in this paper. This observation goes against the predicted hypothesis that technology firms should on average have higher returns than the other firms issuing equity (see sub-sections 2.4.6 and 3.3.2). A common observation in other empirical researches of high-tech companies having higher IPO underpricing compared to the other industries is thus rejected. The results of average IPO underpricing by industry for the period of 2009-2015 are shown in Figure 6.

Figure 6. *Average IPO underpricing by industry*
This figure shows the average initial returns as well as market-adjusted initial returns classified by industry for 83 firms included in the sample for the First North Stockholm market between 2009 and 2015.



4.2.Sample Descriptive Statistics

The main descriptive statistics of all the variables used in the regression analysis are presented below (see Table 1). Even though the initial sample contains 83 IPOs, due to the missing observations for some of the variables and few removed outliers, common sample consists of only 71 observations. Looking at the differences between the mean and the median reveals that some of the variables are not particularly evenly distributed. For instance, Age has a distance between the median and the minimum value equal to 8, while the distance between the median and the maximum value is 109. This shows that Age variable has a long right tail and probably some outliers. The same tendency can be observed for the Offer Size and Proceeds variables.

Table 1. *Sample descriptive statistics*
This table indicates individual sample descriptive statistics for 83 companies that issued new equity on the First North Stockholm market for the period of 2009-2015. As seen from the table, some of the observations for few variables are missing. All variables listed in this table are used in the multiple regression model afterwards.

	MAIR	AGE	OFFER_SIZE	PROCEEDS	LEVERAGE	CA	INDUSTRY01
Mean	0.047	11.976	86,832,922	16,556,900	0.547	0.093	0.120
Median	0.020	8	30,000,000	2,843,946	0.190	0.098	0.000
Maximum	0.954	117	750,000,000	361,000,000	3.730	0.218	1
Minimum	-0.565	0	5,000,000	5,500	0	0.007	0
Std. Dev.	0.291	15.874	139,000,000	56,032,529	0.711	0.070	0.328
Skewness	1.222	4.263	3.016	5.013	1.797	0.598	2.332
Kurtosis	5.255	26.201	12.078	27.422	7.016	2.213	6.437
Jarque-Bera	38.252	2112.868	400.896	2410.320	93.690	7.094	116.065
Probability	0.000	0.000	0.000	0.000	0.000	0.029	0.000
Observations	83	83	81	83	76	83	83

According to Jarque-Bera test, null hypotheses of normal distribution are rejected for all variables, given very small probabilities. Only CA variable has a higher probability, with the rejection of the null hypothesis at 5% significance level. Moreover, only CA variable has relatively close values to the skewness of zero and kurtosis of three. Other variables seem to have a positive excess kurtosis, thus, natural logarithm is used to mitigate this problem for some variables. Non-normal distribution is a common phenomenon in regression analysis. However,

OLS model requires only the residuals to be normally distributed, not each variable individually. Also, for the sufficiently large sample, non-normality is not considered to be a key problem.

4.3. Statistical Tests

In order to check for multicollinearity problem in the dataset, a correlation matrix is produced (see Table 2). As mentioned in the methodology chapter, the correlation coefficient equal to 0.8 is used as a cut-off, meaning that any number higher than this figure is a sign of severe multicollinearity problem. The test for multicollinearity shows that there are no variables correlated close or above the indicated threshold. The only two explanatory variables demonstrating relatively high correlation in comparison to the other regressors are Offer Size and Proceeds. This is quite intuitive due to the fact that there is a positive relationship between these two variables since higher Offer Size may predict higher Proceeds. However, none of the factors are excluded from the multiple regression model as the maximum correlation of 0.25 indicates that multicollinearity does not pose a problem for the analysis.

Table 2. *Correlation matrix for independent variables*
The table indicates correlation matrix for all independent variables used in the multiple regression model. None of the pairs of the variables exhibit significantly large correlation.

	AGE	OFFER_SIZE	PROCEEDS	LEVERAGE	CA	INDUSTRY01
AGE	1					
OFFER_SIZE	-0.044	1				
PROCEEDS	-0.085	0.250	1			
LEVERAGE	-0.052	0.147	-0.056	1		
CA	0.183	0.051	-0.076	-0.033	1	
INDUSTRY01	0.041	-0.165	-0.108	-0.178	0.069	1

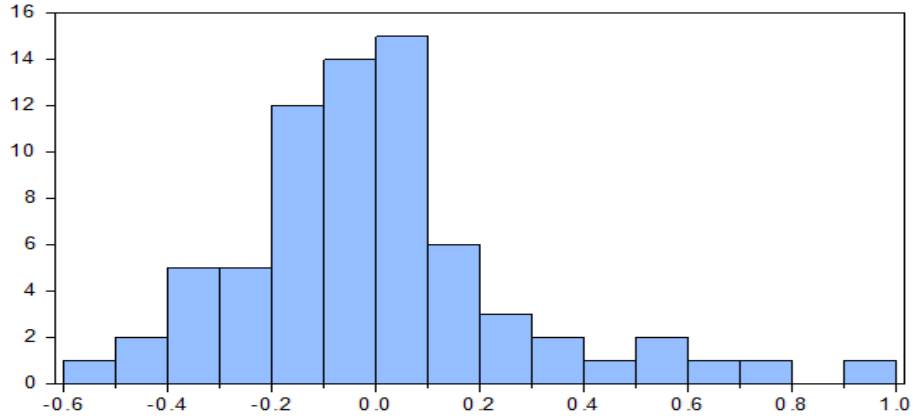
In order to test for the presence of heteroscedasticity, White's test is applied in this study. The test output indicates that the null hypothesis of homoscedasticity cannot be rejected. Both the F- and χ^2versions of the test exhibit p-values (0.783 and 0.701 accordingly) significantly higher than the critical 0.05 value. Therefore, the White's test demonstrates that there is no problem of heteroscedasticity in the dataset.

In order to assess the distribution of residuals, commonly applied Jarque-Bera test is performed. The null hypothesis of normality is rejected since p-value is equal to zero and the distribution has the non-zero skewness and excess kurtosis. In order to determine the reason for non-normality,

the histograms for variables are constructed, which show that there are outliers possibly causing non-normality.

One of the possible options to deal with this violation is to exclude the extreme values and apply natural logarithmic transformation in order to make the variables closer to the normal distribution. However, these measures do not improve significantly the test output since the residuals again do not appear to be normally distributed leading to the rejection of the null hypothesis at 5% significance level (see Figure 7). Accordingly, skewness is equal to 1.017 and kurtosis 4.937. Therefore, further analysis is implemented taking into account that this explicit assumption of the CLRM is not satisfied. This implies that the conclusion regarding the coefficients generated in the regression analysis could be inaccurate. On the other hand, as the sample size is relatively large, the violation of the normality assumption does not cause a major problem. For example, Wooldridge (2009) mention that some econometricians use the number of observation equal to 30 as a satisfactory number allowing the assumption to be relaxed. In this study, a sample of 71 observations in total is used, which is a sufficiently large sample.

Figure 7. *Non-normality test output*
This figure shows Jarque-Bera test for normality results, based on the sample of 71 observations. The test implies skewness of 1.017 and kurtosis of 4.937. The null hypothesis of normality is rejected at 5% significance level: Jarque-Bera statistic is equal to 23.346 with p-value of 0.000.



The linearity assumption is tested conducting the Ramsey's RESET test, which gives t-statistic of 3.057 with p-value of 0.003, F-statistic of 9.343 with 0.003 probability and Likelihood ratio of 9.818 with p-value equal to 0.002. As all p-values are lower than 0.05, the null hypothesis of linearity is rejected at 5% significance level and there is an indication of the non-linear relationship in the model.

As the constructed scatter plots of the dependent variable MAIR against each of the independent variables do not provide clear information regarding the source of non-linearity, a quadratic fitted term of each of the explanatory variables is included in the regression. In total, five different regressions are re-run again separately including squared forms of *ln(Age)*, *ln(Offer_Size)*, *ln(Proceeds)*, *Leverage* and *CA* variables. A significant effect of the squared form would suggest a non-linear effect of any of these independent variables. Moreover, the inclusion of the additional independent variable into the regression is supposed to capture non-linearity. However, as it is seen from the tests results summarized in Table 4, the quadratic terms for the variables are insignificant at 5% level, except for *ln(Proceeds)_SQ*, which has already been found significant. Taking into account the fact that the inclusion of this additional variable into the multiple regression does not lead to any significant improvement in the model fit, as well as the fact that the introduction of the quadratic term would infer the changes in the variable interpretation, the further analysis is decided to be implemented based on the initial model.

Table 3. *The effect of the inclusion of quadratic terms*
This table shows the effect of the inclusion of additional independent variables (quadratic terms) that should capture non-linearity. Coefficients next to the variables and probabilities associated with them are given for the quadratic terms only. Note that for each included quadratic term, a separate regression is run.

Variables	Coefficient	Probability
ln(Age)_SQ	-0.035	0.465
ln(Offer_Size)_SQ	-0.015	0.557
ln(Proceeds)_SQ	0.017	0.014**
Leverage_SQ	-0.046	0.273
CA_SQ	-5.150	0.548

** indicates significance at 5% level

4.4. Regression Results

Contradictory to the earlier research, this study does not find significant evidence for a relationship between the IPO underpricing and all the established variables affecting this phenomenon except Proceeds (Turnover). Despite the fact that in the multiple regression the signs of the relationship between the market-adjusted initial returns (MAIR) and the Age, Offer Size and Proceeds variables were detected similarly to the previous studies, the null hypotheses for these variables that the regressors' coefficients are equal to zero are not rejected at 1%, 5% and 10% significance levels. The influence of the analysed explanatory variables on the level of underpricing is demonstrated in Table 4.

Table 4. *Results from multiple and univariate regressions*

The table presents the final results from multiple as well as univariate regressions. Expected signs of the relationships between the dependent and independent variables are shown on the left. The p-values are presented in the brackets below the coefficient estimates. Values for R-squared, F-statistic with probabilities as well as the number of included observations are provided below.

Variable	Expected Sign	Coefficients (Prob.)						
		Multiple	Univariate					
c	n/a	-0.519 (0.391)	0.132 (0.147)	-0.130 (0.821)	-0.873 (0.001)	0.044 (0.338)	0.034 (0.539)	0.057 (0.119)
ln(Age)	negative	-0.043 (0.338)	-0.041 (0.305)					
ln(Offer_Size)	negative	-0.016 (0.631)		0.010 (0.761)				
ln(Proceeds)	positive	0.064 (0.001)***			0.063 (0.000)***			
Leverage	negative	0.015 (0.757)				0.005 (0.921)		
CA	negative	0.064 (0.904)					0.123 (0.800)	
Industry	positive	-0.037 (0.725)						-0.086 (0.397)
R-squared		0.175	0.014	0.001	0.156	0.000	0.001	0.009
F-statistic (Prob.)		2.258 (0.049)**	1.067 (0.305)	0.093 (0.761)	14.210 (0.000)***	0.010 (0.921)	0.064 (0.800)	0.724 (0.397)
Included observations		71	79	77	79	72	79	79

*** indicates significance at 1% level
** indicates significance at 5% level

The estimated multiple regression equation looks as follow:

$$MAIR_i = -0.519 - 0.043\, ln(Age_i) - 0.016\, ln(Offer\_Size_i) + 0.064\, ln(Proceeds_i) + 0.015 Leverage_i + 0.064 CA_i - 0.037 Industry_i$$

The R-squared (R^2) provides information about the goodness of fit of a model (Brooks, 2014). It measures how well all the explanatory variables included into the regression explain the response variable MAIR. Taking on any value between 0 and 1, R^2 of 0.17 in the multiple regression means that the established model explains only approximately 17% of the initial returns. This figure entails that there is a significant amount of the unexplained variance in the model. The F-statistic of 2.26 is significant at 5% level rejecting the null hypothesis that the regressors' coefficients are jointly equal to zero.

In order to test the first hypothesis, the age of a firm was included in the multiple regression. The expectation was that the higher the firm age, the lower the degree of IPO underpricing since companies, which have a longer operating history, are associated with lower ex-ante uncertainty (Ritter 1984; Ritter 1991). The research found the same result, however, the coefficient for the age factor was not found significantly different from zero.

The second hypothesis aims to test whether the underpricing discount is negatively affected by the offer size. The detected negative sign of the offer size is consistent with the findings by Miller and Reilly (1987) and Ljungqvist (1997). When it comes to the significance of the coefficient, there is no evidence on the explanatory power of the variable, which is in line with the theory by Booth and Chua (1996).

The third hypothesis investigates the relationship between the underpricing and the proceeds generated on the first day of trading. The results are consistent with the finding by Loughran and Ritter (2004). The relationship is found to be positive as well as the coefficient estimate is detected significant at 1% level.

The main idea for the inclusion of the debt to equity ratio in the list of the explanatory variables is that a certain degree of leverage conveys information to the public assuming that a high degree of pre-IPO leverage indicates firm's quality. Expected negative sign is not approved by this research. The detected opposite sign of the relationship may be explained by the fact that the First North firms are relatively small, which means that they tend to have lower leverage ratios making the finding deviate from the previous research conducted by Cai et al.(2004).

Another statistical insignificance of the relationship is determined between the underpricing and the Certified Advisers' reputation, which in this thesis is associated with the underwriters' reputation widely investigated in the previous studies. Besides the detected insignificant coefficient, the relationship between the mentioned variables exhibits an opposite trend to what was expected. The same positive influence on the response variable was found by Ljunqgvist (1999) and Beatty and Welch (1996). In this thesis, the revealed positive and insignificant coefficient can be justified by the specific type of the analyzed firms, small and growing, inferring that other factors not mentioned in this thesis could explain the underpricing of the IPOs offered by these companies better.

In order to test the hypothesis whether the IPOs underpricing is higher in the Technology sector, the dummy approach, applied in the previous studies by Loughran and Ritter (2004), Daily et al. (2005), is used to differentiate the riskiness of this industry by assigning the value of one for the companies belonging to Technology industry. The determined insignificant, as well as a negative coefficient estimate, turns out to be in contrast to the expectations.

4.5. Research Limitations

This thesis investigates the IPO underpricing phenomenon in Nasdaq First North Stockholm market only for the after-crisis period of time, while the trading in this market started back in 2004. This time period selection limits the scope of the research. However, most of the companies listed on the First North during the earlier years have either switched to the main Nasdaq market, have been delisted or are non-existent anymore. Thus, there are limited possibilities to access IPO related data, historical stock prices or IPO prospectuses. Due to such exclusion, the final results might be affected by the survivorship bias.

Moreover, a significant amount of companies (78 out of 161) that are mentioned under the new issues during the 2009-2015 period were excluded from the sample since they are not considered "pure" IPOs. Those companies that switched from the other markets had dual listing, reversed takeovers or spin-offs were excluded from the final sample as this paper concentrates only on the pure IPOs – companies that issued their shares for the first time and directly to the First North Stockholm market. Even though the companies were carefully checked before excluding, some of them were also excluded due to missing information. If the missing observations appeared to be not random, the findings might have been different. As a result, such exclusion, as well as missing observations for some of the variables, limits the scope of this research.

One of the possible explanations for insignificant results obtained from the multiple regression model could be related to the omitted variable bias. As it is seen from the literature review chapter, there are many different factors which might cause and influence IPO underpricing. However, only few of them are included in this study. What is more, Nasdaq First North market is a bit different from other stock exchanges since it is particularly aimed at young and intensively growing companies. Therefore, the usual IPO underpricing influencing factors might not be applicable for this market. Overall, the underpricing phenomenon, as it is seen from 4.1.

section, is not observable for every year and differs from industry to industry. The insignificant coefficients for the influencing factors can, therefore, be related to the fact that the underpricing is not strictly confirmed to be present on the First North market.

4.6. Future Research Recommendations

One of the future research recommendations would be to investigate the IPO underpricing on all Nasdaq First North markets by including IPOs conducted not only in Stockholm but also in Helsinki, Copenhagen and Iceland. Likewise, future researchers could expand the time horizon by including IPOs from the earlier years. It could also be of interest to study the differences of IPO underpricing levels among different industries by including a more detailed analysis of various factors influencing initial returns in several industries. What is more, sub-sampling would be an interesting technique to examine whether the firms issuing equity experience high returns during the first day of trading. One could divide the sample into several smaller sub-samples by firm age, firm size or the offer size. Furthermore, different stock market indexes could also be applied to examine whether this would have a significant impact on the results obtained.

When it comes to IPO influencing factors, potential researchers could consider including additional control variables such as management ownership factor or the IPO introduction method. Some researchers argue that pre-IPO ownership of the management should negatively affect the magnitude of IPO underpricing. Differences in underpricing are also found to be dependent on the introduction method: book building vs. fixed price, where the latter one is expected to be associated with the higher levels of underpricing. In addition to this, other financial indicators, such as operating cash flow, EBITDA or Price-to-Earnings ratio, could be tested if there is a significant relationship between them and the degree of IPO underpricing.

Finally, future researchers could, in addition to IPO underpricing, study IPO underperformance for the Nasdaq First North market. In general, IPOs are proved to be underperforming in the long-run. Investors are often seen as too optimistic in terms of high growth forecasts for IPOs. New issues are also found underperforming in the aftermarket compared to the other stocks. Different methods could be used as well to measure the long-term IPO performance, for instance, Cumulative Abnormal Return (CAR) or Buy and Hold Abnormal Return (BHAR).

5. CONCLUSION

The purpose of this paper was to analyse the IPO underpricing and the factors influencing this phenomenon particularly for Nasdaq First North Stockholm market. IPO underpricing has been investigated by academic researchers for many years, however, no consensus has been reached yet. The magnitude of underpricing varies for different stock exchanges, industries or countries. According to the previous literature review, different motives exists for firms going public, setting their offer prices lower, "leaving money on the table" and giving investors an opportunity to earn abnormal returns. Underpricing is sometimes seen as a rational issuers' behavior to attract enough investors, to stimulate positive market feedback on the upcoming IPO or, on the contrary, to signal the firm's quality.

In this thesis, Swedish IPOs issued on the First North market during the period of 2009-2015 were found to be underpriced on average by 4.74% after adjusting for the overall market returns. The highest degree of underpricing was detected for IPOs belonging to the Consumer Goods industry, with average market-adjusted initial returns of 28.20%, whereas the lowest returns were observed for the Basic Materials sector with -8.89%. Even though the underpricing phenomenon was confirmed for this market, new issues were not strictly underpriced for every year in the sample. For instance, average market-adjusted initial returns for 2012 were as low as -29.59%. Such findings of fluctuating levels of initial returns for different years suggest that IPO underpricing may be a random phenomenon in the First North market. This could be explained by the specific First North structure as this market contains relatively small and intensively growing companies, which may not have enough resources to carry the underpricing risks and tend to set offer prices higher in order to raise as much capital as needed.

As the Swedish IPOs were found to be underpriced on average by 4.74% for a given sample, this paper next investigated what factors might influence such returns. In particular, firms' age, offer size, proceeds, pre-IPO leverage ratio, Certified Advisers' reputation as well as the industry firms operate in were examined. The obtained results were insignificant for all the factors except proceeds, where the significant positive relationship was detected. One of the possible explanations for insignificant results obtained from the multiple regression model may again be related to the specific First North market structure. The usual IPO underpricing influencing factors are found to be not applicable for this market. Therefore, future researchers could try to

include and test the significance of other factors that could explain IPO underpricing better, such as management ownership factor, introduction method, etc. Insignificant coefficients for the influencing factors may also be related to the fact that the underpricing phenomenon is not strictly confirmed for each year in the First North market.

Even though the final results obtained were insignificant, this paper still contributes to the academic research by providing important findings in the presence of the IPO underpricing phenomenon in the Nasdaq First North Stockholm market as well as useful future research recommendations. This study is also helpful for investors, who are interested in risky but rewarding investments. According to the results presented in this paper, investors can actually beat the market and earn, on average, positive returns by investing in the First North Stockholm's IPO market.

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APPENDICES

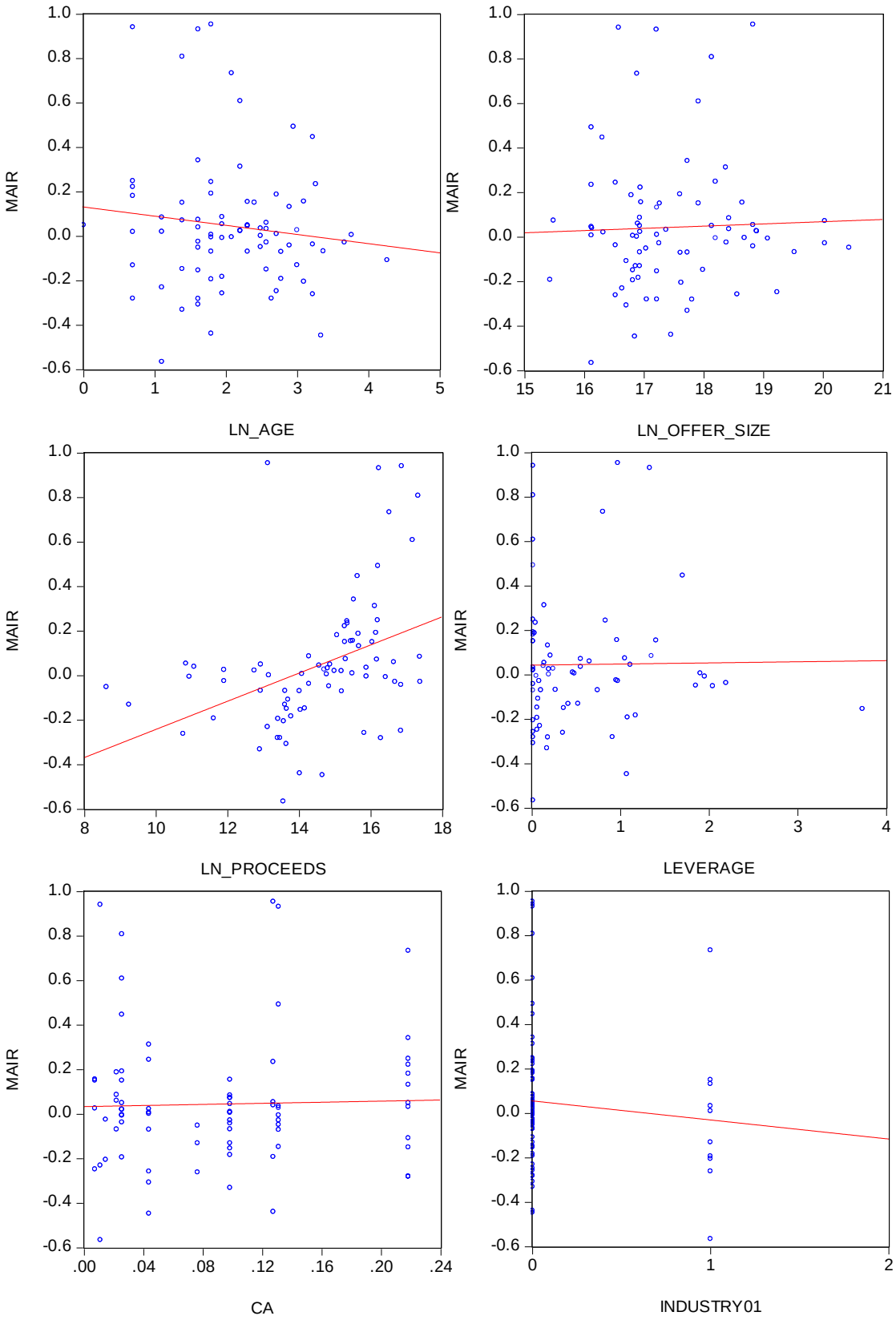
Appendix A. *List of companies included in the sample*

N°	Issue Date	Company	Industry	Certified Adviser
1	2015-12-17	Nuevolution AB	Health Care	Västra Hamnen
2	2015-12-15	Genova Property Group AB	Financials	Avanza Bank
3	2015-12-11	Nilsson Special Vehicles AB	Industrials	Remium
4	2015-12-10	Vicore Pharma Holding AB	Health Care	Redeye
5	2015-12-08	Stillfront Group AB	Consumer Goods	Pareto
6	2015-12-02	A City Media AB	Consumer Services	Mangold Fondkommission
7	2015-12-01	Immunovia AB	Health Care	Wildeco
8	2015-11-30	TC TECH Sweden AB	Industrials	Erik Penser Bank
9	2015-11-23	Maxkompetens Sverige AB	Industrials	Remium
10	2015-11-20	Photocat A/S	Basic Materials	Redeye
11	2015-11-12	Waystream Holding AB	Technology	Avanza Bank
12	2015-11-09	Minesto AB	Oil & Gas	G&W Kapitalförvaltning
13	2015-10-02	Capacent Holding AB	Industrials	Mangold Fondkommission
14	2015-07-13	Footway Group AB	Consumer Services	Erik Penser Bank
15	2015-07-03	Bonäsudden Holding AB	Financials	Wildeco
16	2015-07-01	AB Högkullen	Financials	Avanza Bank
17	2015-06-25	SolTech Energy Sweden AB	Oil & Gas	G&W Kapitalförvaltning
18	2015-06-24	Pegroco Invest AB	Financials	Consensus
19	2015-06-23	Kontigo Care AB	Health Care	Eminova Fondkommission
20	2015-06-16	Hövding Sverige AB	Consumer Goods	Västra Hamnen
21	2015-06-15	A Group of Retail Assets Sweden AB	Financials	Remium
22	2015-06-12	Nilörngruppen AB	Consumer Goods	Erik Penser Bank
23	2015-06-11	Heimstaden AB	Financials	Erik Penser Bank
24	2015-06-10	Inission AB	Industrials	Avanza Bank
25	2015-06-09	Magnolia Bostad AB	Financials	Pareto
26	2015-06-08	Volati AB	Financials	Avanza Bank
27	2015-06-04	Gaming Corps AB	Consumer Goods	Eminova Fondkommission
28	2015-06-03	Corline Biomedical AB	Health Care	Sedermera Fondkommission
29	2015-06-02	SciBase Holding AB	Health Care	Avanza Bank
30	2015-04-27	SpiffX AB	Financials	G&W Fondkommission
31	2015-04-13	IVISYS AB	Industrials	Sedermera Fondkommission
32	2015-04-09	Hancap AB	Industrials	Mangold Fondkommission

N°	Issue Date	Company	Industry	Certified Adviser
33	2015-04-02	K2A Knaust & Andersson Fastigheter AB	Financials	Avanza Bank
34	2015-04-02	Savo-Solar Oyj	Oil & Gas	Mangold Fondkommission
35	2015-03-20	Evolution Gaming Group AB	Consumer Services	Avanza Bank
36	2015-03-17	Cantargia AB	Health Care	Sedermera Fondkommission
37	2015-03-04	Sdiptech Pref (Serendipity)	Financials	Erik Penser Bank
38	2015-02-18	The Lexington Company AB	Consumer Goods	Erik Penser Bank
39	2015-02-16	OrganoClick AB	Basic Materials	Pareto
40	2015-02-10	Karessa Pharma Holding AB	Health Care	Remium
41	2015-01-13	Intuitive Aerial AB	Industrials	G&W Kapitalförvaltning
42	2014-12-19	PowerCell Sweden AB	Industrials	G&W Fondkommission
43	2014-12-18	Verisec AB	Technology	Remium
44	2014-12-18	Prime Living AB	Financials	Mangold Fondkommission
45	2014-12-12	Tobin Properties AB	Financials	Avanza Bank
46	2014-12-01	VA Automotive i Hässleholm AB	Consumer Goods	Avanza Bank
47	2014-11-14	Arcoma AB	Health Care	Sedermera Fondkommission
48	2014-11-12	Bayn Europe AB	Consumer Goods	G&W Fondkommission
49	2014-11-11	Sprint Bioscience AB	Health Care	Redeye
50	2014-10-20	Christian Berner Tech Trade AB	Industrials	Remium
51	2014-10-16	Absolent Group AB	Industrials	Consensus
52	2014-10-15	GWS Production AB	Technology	Sedermera Fondkommission
53	2014-10-02	Stresscompany AB	Technology	Eminova Fondkommission
54	2014-09-18	Advenica AB	Technology	Evli Bank
55	2014-09-04	Italeaf S.p.A.	Industrials	Mangold Fondkommission
56	2014-08-05	DDM Holding AB	Financials	Pareto
57	2014-07-31	LIDDS Holding AB	Health Care	Erik Penser Bank
58	2014-06-30	Nicoccino Holding AB	Consumer Goods	Remium
59	2014-06-19	Hanza Holding AB	Industrials	Avanza Bank
60	2014-06-18	Scandinavian Enviro Systems AB	Industrials	Remium
61	2014-06-18	Heliospectra AB	Industrials	G&W Fondkommission
62	2014-06-05	Akelius Residential Property AB	Financials	Avanza Bank
63	2014-05-21	Clavister Holding AB	Technology	Remium
64	2014-04-25	Matse Holding AB	Consumer Services	Remium
65	2014-04-11	ScandiDos AB	Health Care	Redeye
66	2014-04-09	D. Carnegie & Co AB	Financials	G&W Fondkommission
67	2014-04-07	Doxa AB	Health Care	G&W Fondkommission
68	2014-01-13	BIMobject AB	Technology	Sedermera Fondkommission

N°	Issue Date	Company	Industry	Certified Adviser
69	2013-12-19	North Chemical AB	Basic Materials	Avanza Bank
70	2013-12-03	Ferronordic Machines AB	Consumer Goods	Avanza Bank
71	2013-10-23	Mindmancer AB	Technology	Remium
72	2013-06-19	Kentima Holding AB	Technology	Thenberg Fondkommission
73	2013-06-18	Oscar Properties AB	Financials	Avanza Bank
74	2013-04-23	Nexam Chemical Holding AB	Basic Materials	Remium
75	2013-04-22	Immunicum AB	Health Care	G&W Fondkommission
76	2013-02-15	Vigmed Holding AB	Health Care	Remium
77	2012-10-25	Sportamore AB	Consumer Services	Avanza Bank
78	2012-02-20	Avtech Sweden AB	Technology	Thenberg Fondkommission
79	2011-02-25	Kancera AB	Health Care	Remium
80	2010-08-27	Kopylovskoye AB	Basic Materials	Erik Penser Bank
81	2010-07-07	Pallas Group AB	Industrials	Thenberg&Kinde Fondkomission
82	2010-03-31	Scandbook Holding AB	Consumer Services	HQ Bank
83	2009-05-28	Eolus Vind AB	Industrials	Erik Penser Bank

Appendix B. *Scatter plots between the dependent and independent variables*



Appendix C. *Regression results with included quadratic terms*

Below presented five tables indicate regression results with included quadratic terms: *LN_AGE_SQ, LN_OFFER_SIZE_SQ, LN_PROCEEDS_SQ, LN_LEVERAGE_SQ* and *CA_SQ*. The dependent variable in each regression is the market-adjusted initial returns (MAIR). Method applied: Least Squares. The number of included observations in each regression is 71. The inclusion of the additional independent variables into the regression is supposed to capture non-linearity. However, as it is seen from the tests results, the quadratic terms for the variables are insignificant at 5% level, except for *LN_PROCEEDS_SQ*.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.582	0.609	-0.955	0.343
LN_AGE	0.116	0.220	0.526	0.600
LN_OFFER_SIZE	-0.022	0.034	-0.646	0.521
LN_PROCEEDS	0.065	0.019	3.484	0.010
LEVERAGE	0.008	0.051	0.165	0.870
CA	0.154	0.547	0.282	0.779
INDUSTRY01	-0.047	0.105	-0.450	0.655
LN_AGE_SQ	-0.035	0.048	-0.735	0.465
R-squared	0.182	F-statistic		1.999
Adjusted R-squared	0.091	Prob(F-statistic)		0.069

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.161	7.882	-0.655	0.515
LN_AGE	-0.040	0.045	-0.902	0.370
LN_OFFER_SIZE	0.507	0.886	0.572	0.569
LN_PROCEEDS	0.064	0.019	3.435	0.001
LEVERAGE	0.022	0.051	0.435	0.665
CA	0.065	0.534	0.122	0.904
INDUSTRY01	-0.042	0.105	-0.405	0.687
LN_OFFER_SIZE_ SQ	-0.015	0.025	-0.591	0.557
R-squared	0.179	F-statistic		1.966
Adjusted R-squared	0.088	Prob(F-statistic)		0.074

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.962	1.491	1.987	0.051
LN_AGE	-0.037	0.042	-0.871	0.387
LN_OFFER_SIZE	-0.033	0.032	-1.023	0.310
LN_PROCEEDS	-0.414	0.189	-2.184	0.033
LEVERAGE	0.007	0.048	0.149	0.882
CA	0.138	0.511	0.270	0.788
INDUSTRY01	-0.065	0.100	-0.652	0.517
LN_PROCEEDS_SQ	0.017	0.007	2.533	0.014
R-squared	0.251	F-statistic		3.016
Adjusted R-squared	0.168	Prob(F-statistic)		0.008

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.524	0.600	-0.874	0.386
LN_AGE	-0.049	0.044	-1.106	0.273
LN_OFFER_SIZE	-0.016	0.033	-0.497	0.621
LN_PROCEEDS	0.064	0.018	3.475	0.001
LEVERAGE	0.126	0.112	1.130	0.263
CA	0.050	0.530	0.095	0.925
INDUSTRY01	-0.031	0.103	-0.297	0.767
LEVERAGE_SQ	-0.046	0.041	-1.107	0.273
R-squared	0.190	F-statistic		2.117
Adjusted R-squared	0.101	Prob(F-statistic)		0.054

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.528	0.604	-0.873	0.386
LN_AGE	-0.046	0.045	-1.022	0.311
LN_OFFER_SIZE	-0.019	0.034	-0.567	0.573
LN_PROCEEDS	0.066	0.019	3.492	0.001
LEVERAGE	0.009	0.051	0.175	0.862
CA	1.187	1.933	0.614	0.541
INDUSTRY01	-0.025	0.106	-0.233	0.817
CA_SQ	-5.150	8.520	-0.604	0.548
R-squared	0.179	F-statistic		1.969
Adjusted R-squared	0.088	Prob(F-statistic)		0.074

Appendix D. *Multiple regression results*

This table shows the final multiple regression results with 71 included observations. The dependent variable is the market-adjusted initial returns (MAIR). Method applied: Least Squares.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.519	0.601	-0.864	0.391
LN_AGE	-0.043	0.044	-0.966	0.338
LN_OFFER_SIZE	-0.016	0.033	-0.483	0.631
LN_PROCEEDS	0.064	0.018	3.458	0.001
LEVERAGE	0.015	0.050	0.311	0.757
CA	0.064	0.531	0.121	0.904
INDUSTRY01	-0.037	0.104	-0.354	0.725
R-squared	0.175	F-statistic		2.258
Adjusted R-squared	0.097	Prob(F-statistic)		0.048

Appendix E. *Univariate regression results*

Below presented six tables indicate the final results from univariate regressions. The dependent variable in each regression is the market-adjusted initial returns (MAIR). Method applied: Least Squares. Note that the number of included observations varies for each regression due to the different number of observations for each independent variable.

Included observations: 79

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.132	0.090	1.466	0.147
LN_AGE	-0.041	0.040	-1.033	0.305
R-squared	0.014	F-statistic		1.067
Adjusted R-squared	0.001	Prob(F-statistic)		0.305

Included observations: 77

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.130	0.573	-0.227	0.821
LN_OFFER_SIZE	0.010	0.033	0.305	0.761
R-squared	0.001	F-statistic		0.093
Adjusted R-squared	-0.012	Prob(F-statistic)		0.761

Included observations: 79

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.873	0.246	-3.554	0.001
LN_PROCEEDS	0.063	0.017	3.770	0.000
R-squared	0.156	F-statistic		14.210
Adjusted R-squared	0.145	Prob(F-statistic)		0.000

Included observations: 72

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.044	0.046	0.965	0.338
LEVERAGE	0.005	0.051	0.099	0.921
R-squared	0.000	F-statistic		0.010
Adjusted R-squared	-0.014	Prob(F-statistic)		0.921

Included observations: 79

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.034	0.056	0.617	0.539
CA	0.123	0.483	0.254	0.800
R-squared	0.001	F-statistic		0.064
Adjusted R-squared	-0.012	Prob(F-statistic)		0.800

Included observations: 79

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.057	0.036	1.575	0.119
INDUSTRY01	-0.086	0.101	-0.851	0.397
R-squared	0.010	F-statistic		0.724
Adjusted R-squared	-0.004	Prob(F-statistic)		0.397