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IPOs on the Swedish market

An investigation of underpricing and long-run
underperformance on Nasdaq OMX Stockholm

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Abstract

An initial public offering is defined as the first time the shares of a privately owned firm is offered to the public, and this process is an essential component of financial economics. The reason for going public varies between companies, but the most common incentives is to raise capital for expansion efforts or provide an exit for existing investors. Underpricing of initial public offerings represents one of the most extensively documented empirical stylized fact in corporate finance. However, the extent of underpricing of IPOs varies from nation to nation and sector to sector. Moreover, the long-run underperformance of IPOs represents another empirical stylized fact in corporate finance. In this thesis, the authors will investigate the occurrence of these two stylized facts among Swedish IPOs listed on Nasdaq OMX Stockholm. Also, the possible correlation between IPO frequency and the extent of underpricing and long-run performance will be investigated. Moreover, some of the theoretical explanations for these stylized facts will be examined.

A deductive approach based on a quantitative research with stock data from 90 companies listed on Nasdaq OMX Stockholm between the years of 2002-2017 lays the foundation for the method used to conduct the research on the topic presented. The previously well documented and frequently used equations of MAIR, BHAR and CAR was used to obtain the descriptive statistics needed to investigate the presence of the stylized facts.

The findings of the thesis shows an average initial underpricing of 13.83 %, with a statistical significance at the 1% level. A negative long-run performance of 14.1 % is obtained in the study, however, these findings are proven not statistically significant. The correlation between IPO frequency and underpricing is deemed not statistically significant, with a Pearson correlation of 0.3. Furthermore, the authors do not find significant support for previously empirically tested theories regarding underpricing, when applied to the data set in their study.

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1 Introduction

This chapter will introduce the reader to the background and purpose of this thesis. The chapter also presents subsections such as delimitations, a problem discussion and key definitions. Lastly, the process of an IPO will be presented.

1.1 Background

An initial public offering is defined as the first time the shares of a privately owned firm is offered to the public, and this process is an essential component of financial economics. The reason for going public varies between companies, but the most common incentives is to raise capital for expansion efforts or provide an exit for existing investors.

In the industry of IPOs, there has for a long time been two stylized facts present. The first being that IPOs on average are underpriced and therefore associated with a positive first day return, and this phenomenon is one of the most well recognized stylized facts in corporate finance (Abrahamson & De Ridder, 2015).

The second occurrence is the long-run underperformance of IPOs. These two stylized facts have been supported by empirical research and is considered to be one of the big puzzles in corporate finance (Brealey, Myers and Allen, 2014). From an international perspective, IPO underpricing has been discussed comprehensively by researchers and academics. In Sweden, however, the exploration of this stylized fact has been comparatively low. A new study of the Swedish IPO market is therefore of great significance.

1.2 Underpricing

Underpricing of initial public offerings represents one of the most extensively documented empirical stylized fact in corporate finance. However, the extent of underpricing of IPOs varies from nation to nation and sector to sector (Van Heerden and Alagidede, 2012). Underpricing can be defined as a capital loss made by the company due to the fact that the offer price is lower than the closing price after the first day of trade. This phenomena can also be defined as positive first-day initial returns. As presented by Jenkinson and Ljungqvist, (2001), initial first-day returns that investors experience is positive in practically every country investigated, with an average initial return being 15 percent in industrialized countries, and 60 percent in emerging market economies. There is no reasonable single explanation to why firms chose to leave money on the table (Loughran & Ritter, 2002). But there has been several theories trying to explain the phenomena. Some of these theories has been presented by Ritter (1998) in order to give an explanation to the underlying factors to why firms decides to underprice their IPOs.

1.3 Long-run underperformance

There are multiple reasons of interest to investigate the long-run performance of IPOs. The first reason is seen from the investor's perspective, because the discovery of price patterns in IPOs can be the foundation to investment strategies yielding high returns. The second reason is that there may be a correlation between long-run underperformance and high volume of IPOs, which would result in *issuers* taking advantage of the timing of this window of opportunity (Ritter, 1991). The third reason is related to the external equity capital for firms going public, since the external equity capital is not solely dependent on the transaction cost, but also investors return in the aftermarket.

1.4 Problem discussion

There exists a great body of academic research on the two stylized facts of IPOs, underpricing and long-run underperformance – and some of this research can be seen as contradictory when it comes to the long-run underperformance of IPO stocks. Issuing firms underperform the S&P 500 index by 22% in the long-run (Stern and Bornestein, 1985). Several other studies have confirmed the underperformance of issuing companies (Ritter, 1991; Spiess and Affleck-Garves, 1995). Loughran and Ritter (1995), called the underperformance in the long-run of IPO firms a puzzle. The existence of IPO underperformance has been questioned by Brav et. al (2000) who claims that the underperformance disappears when matching the benchmarks on firm size and book-to-market ratio. Furthermore, Eckbo and Noril (2000) attributes potential underperformance to a lower risk of IPO stocks, providing evidence that the issuing companies have lower leverage ratios and higher liquidity than the matched firms in the years following the IPO. It is argued by Ritter and Welch (2002) that benchmarking of the long-run performance of IPOs is highly sensitive to the choice of sample period as well as an employed methodology. They also note that despite the similar performances of issuers and non-issuers with comparable characteristics, the equally weighted post-IPO returns still underperform market indices, despite the similar performances of issuers and their peers with comparable characteristics.

The stylized fact of underpricing, is indisputable in the results of previous academic research.

The average difference between offer price and first day closing price was 18.8% for US issuers between 1980 and 2001, in addition there was a positive price change for 70% of the issuing sample, while only 14% exhibited negative initial returns (Ritter and Welch, 2002). While the reason for why issuers leave money on the table remains unclear in this research, a wide variety of explanations based on both symmetric and asymmetric information arguments are offered (Ritter and Welch, 2002). Ritter (1991) provides some clarity on the topic by pointing out that investors show tendencies of being periodically overoptimistic about the potential of issuing firms, and that firms time their offers correspondingly to take advantage of the optimism. Additional support for the hypothesis is provided by Loughran and Ritter (1995), showing that first day returns are significantly higher following periods when the market has grown.

In the Swedish market, the research on underpricing and long-run underperformance is less abundant compared to the U.S. This is probably partly due to the fact that the Swedish market is much smaller compared to the U.S market. Research on Swedish IPOs during the time period of 1980-89 and (1990-94), using a sample of 251 IPOs shows an initial return (i.e. underpricing) of 40.7% and (8%) (Rydqvist, 1997). The steep decrease between the 1980s and the 1990s, is according to Rydqvist (1997) caused by the tax and IPO regulations imposed in 1990, which regulated the opportunity for investment banks to use IPOs as tax efficient means of compensation to selected individuals. More recent studies from late 1990s and early 2000s show mixed results of underpricing ranging from 7-15%.

In regards of long-run underperformance, research provided by Loughran et. al, (1994) displays a positive 1.2% abnormal return over a 3-year period sampling firms over a period of 10 years, which does not show evidence of long-run underperformance of IPOs.

By looking at the recent increase in the number of IPOs and positive stock market conditions in Sweden, the authors hope to find some correlation between the frequency of IPOs and the extent of the two stylized facts mentioned (EY, 2018). There is some general support for this given by Högholm and Rydqvist (1995) who links the European “IPO boom” of the 1980s to rising share prices and deregulation, while Ljungqvist (1995) provides evidence that in Germany, the number of IPOs changes over time in line with business cycles, stock market conditions, and the gradual increase in competitiveness of the underwriter market. Furthermore, it is shown that initial returns tend to be higher following periods of high returns on the market index when examining the Swedish markets (Rydqvist, 1993).

With regards to long-run underperformance, there is no support for any significant correlation between IPO frequency and long-run underperformance (Brav, et. al, 2000).

Table 1 Previous studies of underpricing in Sweden

Study	Period	Number of IPOs	Average IR
Rydqvist (1997)	1980-89 (1990-94)	251	40.7% (8%)
Ritter (2003)	1980-1998	332	30.5%
Bodnaruk, Kandal, Massa Simonov (2008)	1995-2001	124	14.2%
Isaksson et. al (2014)	1996-2006	122	15%
Abrahamson & De Ridder (2015)	1996-2011	105	7.7%

1.5 Delimitations

In this thesis, companies listed on the main Swedish market, Nasdaq OMX Stockholm, will be used as sample firms. This means that companies listed on smaller *MTFs* such as Nasdaq First North, Nordic Growth Market and Aktietorget will be excluded from the sample. The reason for this delimitation is mainly the lack of financial data regarding issue prices and stock data, as well as the lack of proper comparison indices. Furthermore, NGM and Aktietorget are significantly smaller markets considering the number of companies listed and the number of new companies listed yearly.

The sample period for the thesis will be from the years 2002 to 2017, and by choosing this time interval, a complete look of both “hot” and “cold” market conditions, as well as a good sample for long-run performance are obtained.

When controlling for long-run performance, an appropriate comparison index will be used. A more detailed approach would be to use specific control firm(s) for each sample firm with regards to size and book-market-ratio, the construction of comparison portfolios is however very time consuming and goes beyond the scope of this thesis. Furthermore, in order to use control firms, in the event that a control firm issues equity or is delisted, one would have to find a new control firm.

Moreover, even though there exists multiple theories explaining the possible reasons for the stylized facts of underpricing and long-run underperformance. The authors will discuss and further investigate a selection of these under the theory of reference. The authors do not intend to further explore or explain all the possible specific reasons for the possible existence of these stylized facts on Nasdaq OMX Stockholm.

1.6 Definitions

Book-building - The process by which the lead manager to a new issue ascertains demand and hence the offer price for the securities.

Due diligence investigation - The process of evaluating and scrutinizing the assets, liabilities, profitability, cash flow, policies, and compliance of a company prior to a potential transaction.

Lead manager - A bank or other financial institution chosen to underwrite a new issue

MTF - any trading platform that brings together multiple third-party buying and selling interests and that is not a regulated exchange run by a recognized market operator

Pro rata – proportional

Prospectus - A document provided by a company wishing to sell newly issued shares or debentures to the public

Retail investor - A retail investor is an individual investor possessing shares of a given security.

Market making – The action of quoting both a buy and a sell price in a financial instrument or commodity held in inventory.

Issuer – the company offering its shares to the public

Underpricing – The act of setting the offer price below the market value

1.7 Purpose

The purpose of the study is to investigate to what extent the two stylized facts of underpricing and long-run underperformance exists on Nasdaq OMX Stockholm, and furthermore if there is a correlation between IPO frequency and the extent of these stylized facts. Hopefully, the research will contribute to a broadening of the empirical framework and the understanding of these stylized facts and their existence. Hopefully the study will improve the understanding of how IPOs behave, given the overall condition of the stock market and the climate of IPOs.

An increased understanding of IPOs, deepens the knowledge of the stock market in general and further improves the ability for corporations and individuals to gain economic profit from the financial system.

Moreover, the following research questions have been developed in order to fulfil the purpose of the study:

- (RQ 1) Is there underpricing of Swedish IPOs on Nasdaq OMX Stockholm?
- (RQ 2) Does IPO underpricing have a correlation to IPO frequency?
- (RQ 3) Is there an occurrence of long-run underperformance of Swedish IPOs on Nasdaq OMX Stockholm?
- (RQ 4) Does IPO long-run underperformance have a correlation to IPO frequency

1.8 The process of going public

In this section, the process of going public will be described using the source of (Jenkinson and Ljungqvist, 2001).

1.8.1 Initial decision and choice of market

Once the decision to go public has been made, there are various steps involved to finalize the process of introducing the company to the public. The first step is typically making sure that the company can satisfy the regulations imposed by stock exchanges and regulatory bodies. When this step is completed, and the company has determined that an IPO is feasible, the company must decide which stock exchange it wants to be traded on.

For a long time, the question of which list to note the shares on was determined by geographical circumstances, and a company would almost always choose to trade their shares on their domestic stock exchange, this is no longer the case. The stock listing are no longer bound by geographical borders. When the proper market has been determined, the process of the initial *prospectus* is initiated. The process of producing a prospectus typically involves several different intermediaries such as lawyers, auditors and investment banks.

1.8.2 Best effort vs. firm commitment

Once the issuing firm have decided which investment bank to hire for their issue, they also need to agree on the contribution of each actor as well as how the risks will be shared among the investment bank and the issuing company. The issuing firm have two types of contracts to consider; best effort and firm commitment.

A “best effort” contract implies that the investment bank only acts as an intermediate and hence does not bear the risk for any shares not sold in the case of undersubscription. A “firm commitment” contract implies that the investment bank will purchase all the shares initially, and then take it upon themselves to resell the shares in the IPO.

It is argued by Baron (1982) that when a firm commitment contract is used, both the issuing firm and the investment bank have symmetric information, and therefore there would be no underpricing. The reason for this is the fact that the investment bank has incentives to maximize their earnings and would therefore sell the issue at the highest price possible. However, when using a best effort contract, the investment bank will only act in its own self-interest. Therefore, it is likely that the investment bank will not have a good enough incentive to undertake the effort needed to entail a high bid price from the investors, hence the share will be underpriced.

1.8.3 Producing a prospectus

When producing the prospectus, there is an initial information-gathering phase, during which the investment bank that has been chosen as *lead manager* works closely with the firm going public to perform the *due diligence investigations* and to produce the information required to satisfy the appropriate regulatory authorities (both the securities regulators and the chosen exchanges). One of the key decisions in all IPOs is the issue price. During the initial information-gathering phase, the analysts from the lead manager will form some initial views of the likely market value of the company, these analyses will serve as the basis for the first research report that can later be used as an initial briefing document for potential investors, before the preliminary prospectus is produced. The investment bank might also conduct some pre-marketing, during which analysts distribute briefing documents to potential institutional investors as a way of introducing the company. After the initial briefing and introduction of the company, the lead managers often ask the institutional investors for feedback regarding the research and any concerns they may have about the company before proceeding with the prospectus, for example concerns about management quality, market volatility etc. During this period, the lead managers may form a syndicate of other banks that will underwrite and/or market the issue to investors together with the lead manager.

When the lead manager has received feedback and the pre-marketing is finished, the initial prospectus is published. This initial prospectus often includes a possible price range for the issue to set a frame of reference for the investors. The marketing phase then continues in a larger scale with the initial prospectus as a base for the marketing campaign.

1.8.4 Marketing

After the initial prospectus is published, the investment bank starts the marketing phase. This almost always includes so called “road shows”, where senior managers of the company together with the investment banks, make presentations in a number of different locations in order to attract important institutional investors. These road shows is often considered to be one of the most important part of the marketing process and companies often visit multiple cities and sometimes even different countries, in order to reach the investors they consider most important to get on board with the issue. Other important forms of marketing may include press briefings, internet alert services and regular advertising.

Contrary to popular belief, the road shows are not intended to provide investors with any new information, but rather for the investment banks to gather information about what the investors think about the initial views of the company and its valuation. In many jurisdictions, issuers are not allowed to divulge any new information not included in the initial prospectus. In offerings where the price has already been fixed, the main purpose of the marketing stage is to elicit bids from investors. Bids that would later be fed into the final stage, and then allocated to investors. For issues where only an initial price range has been set in the initial prospectus, the marketing phase is constructed to produce expressions of interest from various investors. Hence the marketing phases produces a lot additional information regarding the reaction of investors to the initial offering, which is of course used in the process of setting the final price.

1.8.5 Pricing and allocation

The final step of the IPO involves the pricing and allocation of shares. The investment banks now make use of the large volume of information they have received from the potential investors in response to the initial prospectus and the marketing efforts.

In those cases where there is a fixed price on the issue, the only decision remaining is the allocation of shares. If the issue is undersubscribed, all bids can be met in full and the underwriters will take up any unallocated shares. However, should the issue be oversubscribed, then some allocation rule is required. Naturally, in the event of a fixed-price offering, it is not possible to alter the price in response to excess demand or supply, hence, the likeliness of excessive over (or under)-subscription increases. In practice a number of different methods of allocation are observed, which reflect the regulations imposed by the securities regulators and the stock exchange in question.

Most countries have fair allocation rules, meaning that all bids have to be scaled down *pro rata* until supply equals demand. However, as a result, strategic overbidding of shares may occur in order to increase the final allocation of shares. This is type of strategic overbidding is common if an issue is considered as a “hot issue”, meaning it is very likely to have a drastic increase of stock price in the after-market trade.

However, the pro rata allocation rules are not always enforced, and many countries allow for some sort of discrimination in favour of particular types of investors, most often small retail investors. Moreover,

random allocation rules are another type of allocation rule to apply. This essentially means that the shares are allocated completely at random. All these allocation rules are used when the offer has a fixed price.

While there is still a small presence of fixed price issues in some countries, there has been a strong increase towards pricing techniques that determine the issue price only after expression of demand have been elicited from potential investors. The single most popular method is *book-building*.

There are three main steps to book-building. In the first step the investment bank determines which investors will be invited to participate in the book-building. More often than not, small retail investors are not included in the book-building efforts, although a tranche of shares may be reserved for retail investors available for subscription once the final offer price has been set. The two reasons for excluding retail investors are the infeasibility of inviting bids and discussing the issue with a large number of small investors, in addition it is probably true that retail investors are less informed than professional investors.

In the second step, the investors who are invited to participate, submit their indications of demand. There are a number of different forms to these indications. The least informative are *strike bids*. A strike bid simply means that the bidder is prepared to buy a given number of shares at any price within the price range presented in the initial prospectus.

More informative are *limit bids*, where the bidder submits a number of limit bids, at different numbers of shares for different price levels, also known as *step-bids*, which gives the investment bank that particular investors demand curve as a step function. Normally, investors can submit, revise and cancel bids at any time until the book closes. Thus, the book-building process, which typically takes eight to ten working days, is highly dynamic. The book-building process offers both investors and the investment bank a sense for the state of demand, which grows stronger as the process evolves.

At the end of the book-building process, the investment bank running the book effectively has a demand curve for the issue, moreover they also have information on when the bids were submitted and revised. This information is then used during the third phase of the book-building, which will determine the final price and the allocation of shares. It is vital to note that the investment bank, in consultation with the issuing company, have a considerable discretion over the issue price and allocation of shares. Even though the investment bank has a good idea of the demand for the shares on offer, the final price will not be determined by simply crossing demand and supply in a mechanistic manner. The usage of the information in the books of investment banks is a closed kept secret, as they tend to keep their books firmly shut to outsiders. Hence, little is known about how investment banks use the information from a book-building process.

However, investment banks, will when questioned about their books, frequently state that one of their aims in pricing is to produce modest returns for the initial investor, in compensation for contributing with valuable information during the book-building process. This type of underpricing is partly rationalized as a reward to the investors taking part in the book-building process and providing information.

Once the final price has been set, the final prospectus has been published, and the final day for subscription has passed, the final allocations are determined. More often than not, the institutional investors that participated in the book-building get their allocations first, before the final prospectus goes out to the public, and the possible remaining tranche of shares are offered to the public.

The sort of non-discrimination rules that often apply to fixed price offerings do not apply to book-building efforts. As stated earlier, the investment bank, in consultation with the issuing company, will have complete discretion over who is allocated the shares. The final allocation of shares may also reflect the preference of the issuing company regarding the types of initial investors it wants.

Once the final allocations have been decided, the investors who participated in the book-building are contacted to confirm their bids; up until this point the bids are typically not legally binding. The final prospectus, including the issue price, will then be printed, and the shares will normally start trading within a couple of days.

1.8.6 Post IPO

After the IPO has occurred and the shares have started trading, the role of the investment bank might not be over yet. In some instances, investment banks provide further services to the company some period after the trading begins. One of the most important and frequent additional services is the one of stabilizing the price of the shares in the after-market. What this essentially means, is that the investment bank or banks involved in the issuance, stands prepared to buy shares in the company in the event of a downwards pressure of the price, and to sell more shares in the event of high levels of excess demand for the share.

Other post IPO services may include *market making* to insure liquidity and/or providing continued analyst coverage of the stock in order to ensure a steady flow of information about the company.

2 Theoretical framework

This chapter will introduce the reader to the theoretical frame of reference regarding underpricing and long-run underperformance. This chapter will also further introduce the reader to different terms and theories chosen for this thesis.

2.1 Underpricing

IPO underpricing is probably the earliest empirical irregularity in the IPO market. This stylized fact results in two things: a good profit for those investors lucky enough to get their hands on shares in the offering, but also an opportunity cost of going public to the firm's old owners.

Researchers investigating the underpricing phenomena, categorized it for a long time as a puzzling stylized fact. In a perfect market, this phenomenon would not exist - which means that firms going public leave money on the table.

There has been a number of theories constructed explaining the underpricing phenomenon, focusing on the different aspects that exists between investment bankers, issuers and investors. Three out of the seven most common theories used to describe this occurrence presented by Ritter (1998), will be used as a foundation for the theoretical framework in this thesis.

2.1.1 Uncertainty hypothesis

The uncertainty hypothesis states that if the uncertainty about the value of a new issue is high, underpricing of that issue will also be high. The changing risk composition hypothesis, introduced by Ritter (1984), assumes that riskier IPOs will be more underpriced than less riskier IPOs. It has been argued by Loughran and Ritter (2004) that a small part of the increase in underpricing can be attributed to the changing risk composition of firms going public. Beatty and Ritter (1986) have also argued that the greater the uncertainty about the value of a new issue is, the greater the underpricing needed to attract uninformed investors.

According to Boudriga, Slama and Boulila (2009) the size of the issuing firm can be used to measure the ex-ante risk of IPOs. The size of the issuing firm is usually negatively associated with its risk. Finkle (1998) has shown that larger firms have better access to investment capital and resources, both of which are crucial for the issuing firm's profitability and survival. Several previous empirical studies have shown a negative relationship between the level of underpricing and firm size (Alli, Subrahmanyam & Gleason 2010; Carter, Dark & Singh 1998; Ibbotson, Sindelar & Ritter 1994; Jewartowski & Lizinska 2012; Suchard & Singh 2007). On the contrary, some studies have reported the opposite result, and found a positive relationship between the two variables (Marisetty & Subrahmanyam, 2010).

2.1.2 The signalling hypothesis

The signalling hypothesis states that underpricing is used to maintain a good relationship with the other players of the market. Ritter explained it as ‘‘underpricing leaves a good taste’’ – because it gives the investors an opportunity to profit due to initial returns.

Empirical evidence shows moderate results regarding the relationship between the offer price and the level of underpricing. Ibbotson, Sindelar and Ritter (1988), Guo and Brooks (2008) and Dimovski, Philavanh and Brooks (2011) all found that firms that set a low offer price tend to record high levels of underpricing. Moreover, Certo et al. (2003) suggests that higher offer prices indicate a lower uncertainty regarding the future performance of the firm. On the contrary, Kutsuna, Dimovski and Brooks (2008) found a statistically significant positive relationship between offer price and underpricing.

Additionally, Jain and Kini (1999) found that a low offer price is associated with lower underpricing and Fernando, Krishnamurthy and Spindt (1999) found a U-shaped association between the two variables.

2.1.3 Hot issue markets

According to Ritter (1998), a hot market is a period of time that has a high number of IPOs and a high level of initial returns. The concept of a ‘‘hot market’’ was first reported by the authors Ibbotson and Jaffe (1975), whom defined the hot market-period as a time where the average monthly first-day returns is bigger than the median first day return.

In 1972, the Securities Exchange Commission investigated this phenomena by a ‘‘hot issue’’ hearing and a report on the special study of security markets (Ibbotson & Jaffe, 1975). The strength of these patterns differs over time, with both the underpricing and subsequent underperformance. A few years later, Ritter (1984) showed that hot market periods also were characterized as periods with high IPO volume, underpricing and recurrent oversubscriptions. These characteristics was later confirmed by the authors Ibbotson, Sindelar & Ritter (1994). The authors Lowry & Schwert (2002) additionally found a relationship amongst months, high average first-day returns and frequency.

There are substantial evidence implying that firms within the same industry has a cyclical tendency to take their company public, which is tailed by a weighty underpricing and long-run underperformance (Lowry, 2003).

The same evidence indicates that there are more investments in a hot market. A theory regarding the ‘‘hot issue market’’ that was developed by Miller (1977) and further discussed by Morris (1996), implies that the investors that are the most optimistic regarding an IPO, is the one that already have invested in it, and they are therefore a major contributor to determining the market price. In a later stage of the IPO cycle, when more information regarding the issuing firm is released, the optimism fades – and they sell of their shares. Consequently, if the company decides to issue more shares, the first investor’s optimism will fade – and as a result the share price will drop.

2.2 Long-run underperformance

Initial public offerings have been documented to have tendency's to underperform their market competitors for the first few years after the offerings. Is it an equilibrium phenomena that arises from asymmetric information? Can it simply be explained by irrational behaviour from investors? Or is it an error during the measurement process of the long-run underperformance?

2.2.1 The correlation between long-run underperformance and underpricing models

There is a lack of IPO-literature unifying the notion of both underpricing and long-run performance. However, there can be seen in some hypotheses presented that results measured from long-run performance can shed light on the rationality of underpricing - as for example in the signalling approach.

2.2.2 The signalling hypothesis

Under the postulation that the issuers have superior information, the issuers are looking to use signalling, in order to communicate their quality as issuers by intentionally underprice IPOs with the hopes to reach the desire result of to "leave a good taste in investors mouth". This strategy will also lead to an increase performance in the secondary market. Therefore, a later emission could be placed in the same market but under higher conditions – which would financially compensate the issuers with the IPO underpricing (Ipo-underpricing.com, 2018).

Instead of trying to predict the future performance of companies, signalling theories instead requires positive after-market return, given that firms consciously underprice their IPOs with the objective to sell additional future shares at a higher price in the absence of the signal. A falling share price would not be considered to be in line with the strategy of multiple sale stage as assumed in the signalling approach.

However, signalling is not sensible when applied to average firms. An example of this can be seen when Jenkinson and Ljungqvist (2001) examined both the raw and excess returns of the average German IPO firm. Their empirical investigation displayed that the average German IPO firm traded below its first day price after three years, but yet managed a positive raw three year return, as a result of dividend payments. However, what is applicable or not on the average firm, does not necessarily apply to the quality distribution of issuers.

2.2.3 Book-building theories

The authors Benveniste and Spindt (1989), categorizes IPO underpricing as a reward to more well-informed investors as a compensation for revealing more accurate and truthful information during the stage of book-building. The information these investors reveal is the foundation of which the revision in the offer price relative to the initial price range. This means that when more positive information is being revealed to the underwriter, the offer price will revise upwards.

Nonetheless, the price alteration will not be fully completed, as some money must be "left on the table" to compensate investors for their truthful and accurate revelation of information. When taking this into

consideration, one might take the conclusion that subsequent performance will have a positive correlation with the initial price revision.

Furthermore, this theory may also explain the stylized fact of underperformance: if there are a majority of cases of negative information, the long-run performance may be affected, and be negative on average. However, the current available information regarding this theory of underperformance is insufficient – companies priced above the initial range in the sample collected by Hanley (1993) did not perform better than those priced below it.

2.2.4 Behavioural explanation of long run underperformance

The authors Aggarwal and Rivoli (1990), debates for the possibility that there are certain trends in the IPO market, meaning that investors at times initially being over-optimistic about the future of newly listed companies, and as a result bidding up initial trading prices over their true value.

This statement is strongly correlated to traditional underpricing models, which assume that the instantaneous after-market values an initiation efficiently. According to Aggarwal and Rivoli (1990), there is a possibility that it is the lower price in the long run, rather than the initial trading price that represents the company's true value.

This notion would in this case imply that IPO underpricing is an ambiguity: the first day price increase is not a result of the offer price being set too low, but rather to investors overvaluing a firm the first day of trading. However, this explanation raises two questions:

1. Why do not investors learn from past mistakes?
2. Why don't issuers take full advantage of investors being over-optimistic by raising offer prices until equilibrium?

There is some evidence that can be interpreted to indicate that investors indeed regularly overestimate the future forecasts of IPOs. The authors Mikkelsen et al. (1997) displays that long run performance, and the variation in operating performance from before to after the initial public offering are negatively correlated: when operating performance does not reach the pre-listing levels of profitability, share prices will as a result fall, demonstrating that investors were surprised by the change in operating performance.

3 Methodology

This chapter will explain the methodology and method of the thesis. Additionally, the areas of qualitative and quantitative data, and deductive and inductive approach will be discussed.

3.1 Introduction to method

A method is according to Lewis et al. (2009) the procedure of collecting and analysing data. This procedure can be defined by the research strategy. The study of this thesis will investigate IPO's on Nasdaq OMX Stockholm during the time period 2002-2017 and investigate whether or not the two stylized facts of underpricing and long-run underperformance exists, and if there is a correlation between these and IPO frequency over time.

3.2 Sample selection and data collection

The sample for this study will consist of Swedish companies that performed an IPO on Nasdaq OMX Stockholm between the years 2002-2017 and are still listed today. The total number of the sample population for the period was 173 companies.

Through closer observation of the sample, rejections were made based on the following criteria:

- Lack of financial information
- Lack of financial prospectus
- Name changes, after IPO
- Secondary listings
- Transfers between lists (Swedish and foreign)
- Spin-offs
- Delisting
- M & A

The bulk of the data will consist of stock prices accessible through various financial databases. The prospectus needed to find offer prices for each IPO is generally easily accessible through respective company's website or on the website of the underwriters.

The data needed for the thesis was collected from Thomson DataStream, NASDAQ Nordic, the Swedish tax authority and the prospectus of the respective companies.

3.3 Deductive and inductive approach

There exist two different ways of performing research. First, the deductive approach, which is when a theory is tested towards empirical facts. The process of the deductive approach is developing a hypothesis based on existing theory, design a research strategy to test the hypothesis and finally generating an end conclusion that either rejects or accepts the hypothesis. Secondly, the inductive approach, and the process consists of developing a theory from the results of observations made. The inductive approach is considered more flexible compared to the deductive approach (Saunders et al, 2007).

3.4 Qualitative and quantitative data

In business research, there are mainly two ways of classifying data, the qualitative and quantitative classification. Qualitative data is the information or collections of observations about such variables that are descriptive of attributes, characteristics, behaviours or opinions that do not have numerical values in themselves. For example, the opinions held by a focus group on a certain subject. Quantitative data is the information relating to variables and the observations of which are made on a scientifically recognized measurement scale, such that the information can be used for testing of hypotheses using quantitative techniques of descriptive and inferential statistics, and that can be presented using charts and tables (Duignan, 2007).

3.5 Research design

According to Lewis et al. (2009), research can be conducted as either exploratory, explanatory or descriptive. The idea of an exploratory research is to become more accustomed with either an area or a problem. An explanatory research has the aim to find a relationship between variables, from theory grounded expectations as explained by Malhotra & Grover (1998), and a descriptive research is conducted in order to describe a problem. However, a research question can both have more than one dimension and purpose to it, and can therefore be a mixture of any of the three. The purpose to the thesis research is to answer the research questions, which are;

- Is there underpricing of Swedish IPO's on Nasdaq OMX Stockholm?
- Does IPO underpricing have a correlation to IPO frequency?
- Is there an occurrence of long-run underperformance of Swedish IPO's on Nasdaq OMX Stockholm?
- Does IPO long-run underperformance have a correlation to IPO frequency?

In order to study and understand a problem, and understand the relationships between the different variables of the problem, is the idea of an explanatory research. This type of research is often accompanied by quantitative data collection as described by Lewis et al. (2009). A quantitative research can be defined as a research that is explaining different phenomenon by collecting numerical data that are analysed by using mathematically based methods as explained by Aliaga & Gunderson (2002). This thesis objective is to investigate IPO frequency in relation to underpricing and long-run underperformance – and will therefore

answer these questions with an explanatory research with the help of a quantitative research method and a deductive approach.

3.6 Research strategy

According to Lewis et al. (2009) there exists different strategies that can be used to answer the research question. These strategies are either experiments, surveys, grounded theories, case studies, ethnography and archival or action research. The different strategies are used depending on the research purpose, but also however the research approach are deductive or inductive. The statistical method is also proposed as a well-used strategy when the data is quantitative (Bugler, 2012).

This thesis is completed by a methodology that consists of a deductive method of quantitative secondary data collection of stock performance as well as prospectus from the companies investigated. Furthermore, stock prices will be analysed to test for the long run performance of the companies compared to stock market indices. Moreover, the mentioned stylized facts will be explained using prior empirical evidence as well as existing theory on the subject.

The purpose of the thesis, which is mentioned in chapter 1.6 *Purpose* and 3.1 *Introduction to method* can be achieved by analysing numerical data from a statistical perspective. Bivariate analysis will be used to analyse the numerical data. A bivariate analysis is the observations of two different variables, and the observations will be an important part of the analysis (Bugler, 2012).

Lastly, this thesis will apply a positivistic philosophy, meaning that the thesis will base its conclusions on hypotheses, pure data, statistical probability, a large sample as well as independent authors (Easterby-Smith, Thorpe and Jackson, 2015; Saunders, Lewis and Thornhill, 2016).

3.7 Research method

3.7.1 Hypotheses

From the research questions and the theoretical framework, the following hypotheses were developed:

H_{10} : The mean market – adjusted initial return $(\overline{MAIR}) = 0$

H_{11} : The mean market – adjusted initial return $(\overline{MAIR}) \neq 0$

H_{20} : The mean long – run performance (\overline{CAR}) and $(\overline{BHAR}) = 0$

H_{21} : The mean long – run performance (\overline{CAR}) and $(\overline{BHAR}) \neq 0$

H_{30} : There is no association between the level of underpricing and the PRICE of the issuing firm

H_{31} : There is a negative association between the level of underpricing and the PRICE of the issuing firm

H_{40} : There is no association between valuation uncertainty and the level of underpricing

H_{41} : There is a positive association between valuation uncertainty and the level of underpricing

H_{50} : There is no association between the level of underpricing and HM – state

H_{51} : There is a positive association between the level of underpricing and the HM – state

3.7.2 Devise measures of concept

According to Bugler (2012), a concept in quantitative research has to be measured using dependent and independent variables, and comparing these against an indicator. In this thesis, the usage of t-statistic and linear regressions will serve that end. The dependent variables will be the calculations for underpricing and long-run underperformance and the independent variables will be selected based on the previous literature. The indicator will be the index for the Swedish main stock market (OMXS30) for underpricing, and the corresponding sector indices from Nasdaq OMX Stockholm for long-run performance.

3.8 Methodology for initial returns

3.8.1 Market adjusted initial return

As suggested by existing theory (Ritter & Welch, 2002), there are two methods frequently used to calculate initial returns, Initial Returns (IR) and Market adjusted initial returns (MAIR). Since IR does not take the movement of the market into account, and the fact that the initial return of a stock could be highly influenced by the general movement of the market at any point, this thesis will use the MAIR when calculate the initial return. When calculating the MAIR, a benchmark needs to be determined to represent the movement of the market. For this thesis the index OMXS30 will be used as the benchmark. The MAIR is defined as:

$$MAIR_{i,1} = \frac{P_{i,1} - P_{i,0}}{P_{i,0}} - \frac{M_1 - M_0}{M_0} \quad (1)$$

Where:

$MAIR_{i,1}$ = The Market adjusted initial return of the company i at time 1

$P_{i,0}$ = the offer price of company i

$P_{i,1}$ = The first day closing price of company i

M_0 = The first day opening price for OMXS30

M_1 = The first day closing price for OMXS30

The sample mean market-adjusted initial return is then defined as:

$$\overline{MAIR} = \frac{1}{n} \sum_{i=1}^n MAIR_{i,1} \quad (2)$$

When measuring the MAIR a positive return indicates an underpriced stock, while a negative initial return indicates an overpriced stock.

3.8.2 Statistical test for initial returns

To test the null hypothesis: *The market adjusted initial return (MAIR) = 0* the following t-Statistic will be calculated:

$$t = \frac{\overline{MAIR}_{i,1}}{\sigma/\sqrt{n}} \quad (3)$$

Where: σ is the standard deviation of $MAIR_{i,1}$ for 'n' number of firms.

In addition to the t-statistic, the relative wealth index will be used. The relative wealth index suggested by Ritter (1991) is adopted as a conventional method to determine the degree of underpricing. A relative wealth greater than 1.00 can be considered as an IPO that outperforms the market, while a value smaller than 1.00 indicates underperformance compared to the market. It is often used to measure for long-run performance, but according to Vaan Heerden & Alagidede (2012) the relative wealth is also relevant for measuring initial returns. The measure is defined as:

$$WR = \frac{(1 + MAIR_1)}{(1 + \text{Return for OMXS30}_1)} \quad (4)$$

3.8.3 Regression

A regression analysis will be used to gain some insight as to what might cause the underpricing and connect the findings to prior empirical research. To further clarify the objective of the regression, a number of hypotheses are developed which are connected to the explanatory variables and their corresponding theories. The analysis yields an equation describing the relationship between the variables in the regression. The independent variables, or explanatory variables, are identified under the three categories of issue-specific characteristics, firm-specific characteristics and market specific characteristics.

Issue-specific characteristics are defined as offer-related characteristics such as offer size, offer price and total listing period. Firm-specific characteristics are defined as factors as firm size, book value and ownership structure. Market-specific characteristics are those specific to the stock market, such as market

volatility, or whether the market is considered “hot” or “cold”. Each variable will act as a proxy for testing the prior mentioned theories.

From prior empirical research, there are several variables and theories to test for. Due to both a lack of time and data, one variable from each category will be used in the regression. The chosen variables, their respective theory and the expected sign presented in *Table 2*.

Table 2 Explanatory variables

Explanatory Variables	Variable in Model	Variable Measure	Expected sign	Variable Proxy for theory
<u>Issue-specific characteristics</u>				
Issue Price	PRICE	Offer Price for the issue	-	Signalling hypothesis / Uncertainty hypothesis
<u>Firms Specifics</u>				
Firm Size	Fsize	Total assets at the end of the year preceding the IPO of an issuing firm	-	Uncertainty hypothesis
<u>Market Specific Characteristics</u>				
Hot Issues Market	HM	Hot issue market was identified as issue year using IPO volume and first-day return where number of IPOs and average first-day returns (in the sample) are greater than the sample's average. Dummy variable, which denotes 1 for “hot issue” market’ and 0 for “otherwise”	+	Hot Issue market/Window of opportunity hypothesis

From the variables in *table 2* and the hypotheses, the regression is explained by the following equation:

$$Underpricing = \beta_0 + \beta_1 PRICE + \beta_2 Fsize + \beta_3 HM + \mu_i \quad (5)$$

3.9 Methodology for long-run underperformance

When measuring the long-run performance of IPOs, two methodologies are generally used. The event-time approach and calendar-time approach. Several different models can be used within these two methodologies to measure the long-run performance. In this thesis, the event-time approach will be used.

3.9.1 Event-time approach

The premise of the event-time approach, is measuring the long-run returns of an IPO for a set time-frame following the IPO. The results for the single IPO is then bundled together with other IPOs to create a portfolio.

The event-time approach measure the difference between the return of a stock and a selected benchmark for a certain period. In this thesis, each company will be benchmarked against their corresponding Nasdaq OMX Stockholm sector index. The convention of much of prior research conducted on the analysing of abnormal returns has been to summarize either daily or monthly returns over time and using these returns to compute either the cumulative abnormal return (CAR) or by calculating a buy-and-hold abnormal return (BHAR) (Barber and Lyon, 1997; Ritter, 1991). The two different equations are defined as:

$$CAR_{it} = \sum_{t=1}^T AR_{it} \quad (6)$$

Were:

R_{it} = the simple ln-return of stock i at day t ,

(R_{mt}) = the ln-return on a comparable index m at day t

$AR_{it} = R_{it} - (R_{mt})$ = the abnormal return in day t .

By cumulating across a five year period (T = five year time period) generates a cumulative abnormal return:

$$CAR_{it} = \sum_{t=1}^T AR_{it}$$

The last step of the CAR calculation is to calculate an aggregated mean CAR for the sample group with equal weights, shown in equation X below:

$$\overline{CAR}_T = \sum_{i=1}^N w_i CAR_{i,t} \quad (7)$$

Where:

$$w_i = \frac{1}{N}$$

The same definitions are applied to the BHAR model:

$$BHAR_{it} = \prod_{t=1}^T [1 + R_{it}] - \prod_{t=1}^T [1 + (R_{mt})] \quad (8)$$

Where:

$\prod_{t=1}^T [1 + R_{it}]$ = the buy-and-hold return for an investment in stock i

$\prod_{t=1}^T [1 + (R_{mt})]$ = the buy-and-hold return for an investment in the benchmark m .

Lastly, the aggregated sample mean is calculated by the following equation:

$$\overline{BHAR}_T = \sum_{i=1}^N w_i BHAR_{i,t} \quad (9)$$

Where:

$$w_i = \frac{1}{N}$$

As argued by Barber and Lyon (1997) and Mitchell and Stafford (2000), BHAR is preferred over CAR when calculating for long-run abnormal returns for two reasons. Firstly, BHAR measures the underlying parameter of interest, which in this case is the long-run performance of the common stock of sample firms relative to an appropriate index comparison. Secondly, CAR are biased predictors of BHARs. When comparing CAR and BHARs, a mean annual BHAR of 5% can be interpreted as the additional return from investing in that firm relative to the control index. By comparison, a 12-month CAR of 5% does not readily translate into a measure of annual performance. Furthermore, another difference between CAR and BHAR is the fact that CAR does not incorporate compounding, while BHAR does. In this thesis, both the methods of BHAR and CAR will be used for computation of long-run performance to be able to compare the results against each other, should there be any large differences between them.

3.9.2 Statistical tests for long-run performance

To test the null hypothesis: H_20 . The mean long – run performance (CAR) and (BHAR) = 0 the following t-Statistic will be calculated:

$$t = \frac{\overline{CAR}_T}{\sigma(CAR_T)/\sqrt{n}} \quad (10)$$

$$t = \frac{\overline{BHAR}_T}{\sigma(BHAR_T)/\sqrt{n}} \quad (11)$$

Equations 10 and 11 shows the T-test, where \overline{CAR}_T and \overline{BHAR}_T are the sample means and $\sigma(CAR_T)/\sqrt{n}$ and $\sigma(BHAR_T)/\sqrt{n}$ is the cross-sectional sample standard deviation of the samples consisting of n firms.

Furthermore, Barber and Lyon (1997) documented that the Buy-and-Hold abnormal returns are positively skewed and that this leads to a negatively biased t-statistics. To eliminate the skewness bias, this study will implement a bootstrapped skewness adjusted t-statistic as proposed by Barber et al (1997). The bootstrapped t-statistic is defined as:

$$t_{sa} = \sqrt{n}(S + \frac{1}{3}\hat{y}S^2 + \frac{1}{6n}\hat{y}) \quad (12)$$

Where:

$$S = \frac{\overline{BHAR}_T}{\sigma(BHAR_T)}, \text{ and } \hat{y} = \frac{\sum_{i=1}^n (BHAR_{iT} - \overline{BHAR}_T)^3}{n\sigma(BHAR_T)^3}$$

\hat{y} = coefficient of skewness

3.10 Cross-sectional study

A cross-sectional study is used to examine the difference between underpricing and long-run underperformance differences between different time-periods. The IPOs are divided into 15 subsets depending on the year of listing (2002-2017).

For the long-run performance however, the subsets are reduced to 10, since the long-run period is measured over five years.

3.11 Evaluation of research approach and methods

As mentioned earlier in this thesis, this is a deductive study with the objective to link the empirical findings to the suggested theories (Johansson Lindfors, 1993). In other words, the main theories for underpricing, which are; the uncertainty hypothesis, the signalling hypothesis, and the hot market issue – as well as our theories for long-run underperformance, which are; the signalling theory, book building theory and behavioural finance theory will support the statistical calculations.

In this thesis, a bivariate analysis in the form of a multiple regression and correlation analysis together with hypothesis testing will be used. In the analysis, the dependent variable for underpricing will be the market adjusted initial return, and the independent variables will be issue price, firm size and average first day returns combined with IPO-frequency when testing for the signalling hypothesis, uncertainty hypothesis and hot issue market respectively. When testing for long-run performance, a t-statistics will be used. Underpricing is quantified as the difference between the IPO offer price and the first day closing price. As explained by Lewis et al. (2009), an important aspect of the deductive approach is to make the facts operational. This means that facts need to be quantified before being used in statistical methods.

When conducting research there is always a possibility of errors in the data or the calculations. The data obtained from DataStream, NASDAQ as well as the companies' prospectus have been trusted to be correct due to their authoritativeness. The risk of exposure to incorrect data have been decreased by critical observation and additional sources. After retrieving the data, there is also the element of human error present when handling and compiling the data. By using only acknowledged standards and being attentive in the creation of spreadsheets, tables and the like, the risk of human error has been minimized. Furthermore, the models and equations used are assumed to be correctly specified and have all the relevant variables included to support the theories tested for.

4 Empirical findings

This chapter will present the empirical findings of the study and their corresponding statistical significance

4.1 Underpricing

4.1.1 Sample and descriptive statistics

From the total population of 173 companies on Nasdaq OMX Stockholm, the sample data set for the test of underpricing consists of 90 companies from Nasdaq OMX Stockholm that were first listed on the stock exchange between the years of 2002-2017, and are currently still listed. Companies that have been delisted are excluded from the sample. The full dataset can be found in appendix 1.

Table 3 Descriptive statistics, underpricing

IPOs on Nasdaq OMX Stockholm 2002-2017	
Number of IPOs	90
Number of underpriced IPOs (+)	72
Number of overpriced IPOs (-)	18
Average underpricing (IR)	13.73%
Average market adjusted underpricing (MAIR)	13.83%
Max (MAIR) (underpricing)	250.7%
Min (MAIR) (overpricing)	-17.66%
Standard deviation of MAIR	33.47%
Median	6.95%
Skew	5.24
Excess kurtosis	29.6
25th percentile	0.55%
75th percentile	16.54%

4.1.2 Statistical significance

Table 4 Statistical significance, underpricing

	Number of IPOs	Average IR	Average MAIR	t-Statistic	WR
2002	3	1.12%	2.87%	0.5852	1.05
2003	0	N/A	N/A	N/A	N/A
2004	1	-8.00%	-8.00%	N/A	0.92
2005	4	42.46%	42.32%	1.0158	1.42
2006	6	4.25%	4.57%	1.6234	1.05
2007	6	44.74%	45.43%	1.1041	1.46
2008	2	-7.93%	-10.35%	-1.7986	0.88
2009	0	N/A	N/A	N/A	N/A
2010	3	-4.39%	-4.84%	-3.3336**	0.95
2011	4	-0.26%	0.53%	1.29	1.01
2012	0	N/A	N/A	N/A	N/A
2013	2	5.77%	6.23 %	16.7131***	1.07
2014	14	8.38%	8.35 %	2.7956**	1.08
2015	18	12.26%	12.21%	3.9195***	1.12
2016	13	20.73%	21.05%	3.1970***	1.21
2017	14	13.41%	13.98%	4.8933***	1.15
2002-2017	90	13.73%	13.83%	3.9186***	1.14

* Significant at the 10% level.

** Significant at the 5% level

*** Significant at the 1% level

From table 4 one can see that the t-statistic is significant at the 1% level and thus the null hypothesis can be rejected and conclude that the \overline{MAIR} is different from 0. This further means that there is a significant sign of underpricing among Swedish companies listed on Nasdaq OMX Stockholm 2002-2017, as expected when considering the empirical findings in previous literature. The average MAIR is 13.83% and is slightly higher than the average IR, meaning that the market return from the subscription period to the IPO date for all the IPOs in the sample is negative on average. Earlier studies show a higher level of underpricing related to earlier timeframes, which implies that underpricing has changed over time. The previous studies shown in table 1, indicates a higher underpricing ranging from 30-40%, while the later studies on the Swedish IPO market shows an underpricing range of 15-7%, which is more in line with the results obtained in this study.

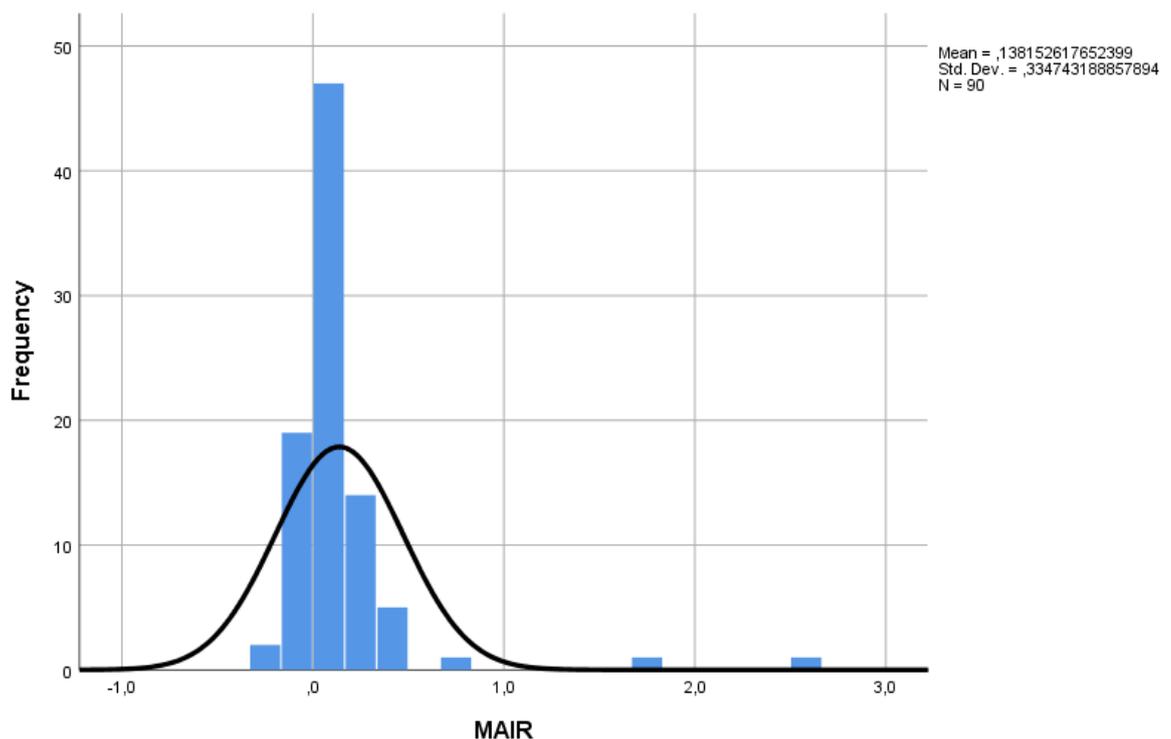
The positive WR further indicates that the IPOs outperform the market on average. Out of the 13 years the WR was measured, only three showed a WR below one.

The median value of the MAIR is 6.95%, indicating that half of the observations have a higher initial return than 6.95%. As the median is lower than the mean, which is 13.83% the sample appears to be skewed to the right. The higher mean value is caused by a few high observations pulling the mean above the median. The skewness of 5.24 indicates a highly positive skew of the sample. That is, there is more data in the right tail of the distribution than what is expected in a normal distribution. Moreover, the 75th percentile shows

that 75% of the observations have an underpricing of 16.54% or lower, this again implies that 25% has a underpricing above 16.54%, showing that a quite high level of underpricing is not uncommon in the Swedish IPO main market. Even though some observations contribute heavily to the positive mean, the min and max values of 250.7% and -17.66% indicates a substantial difference in the max and min values, indicating more extreme positive values compared to the negative values.

An excess kurtosis of 29.6 indicates a large deviation from the normal “bell” shape. This large kurtosis is caused by extreme positive outliers in the sample. By excluding the two most extreme positive outliers, the kurtosis is lowered to a value of 3,06, which still indicates a large positive kurtosis, although not as extreme as for the whole sample. The distribution of the sample of underpricing observations is pictured in the histogram below.

Figure 1 Histogram of the underpricing sample

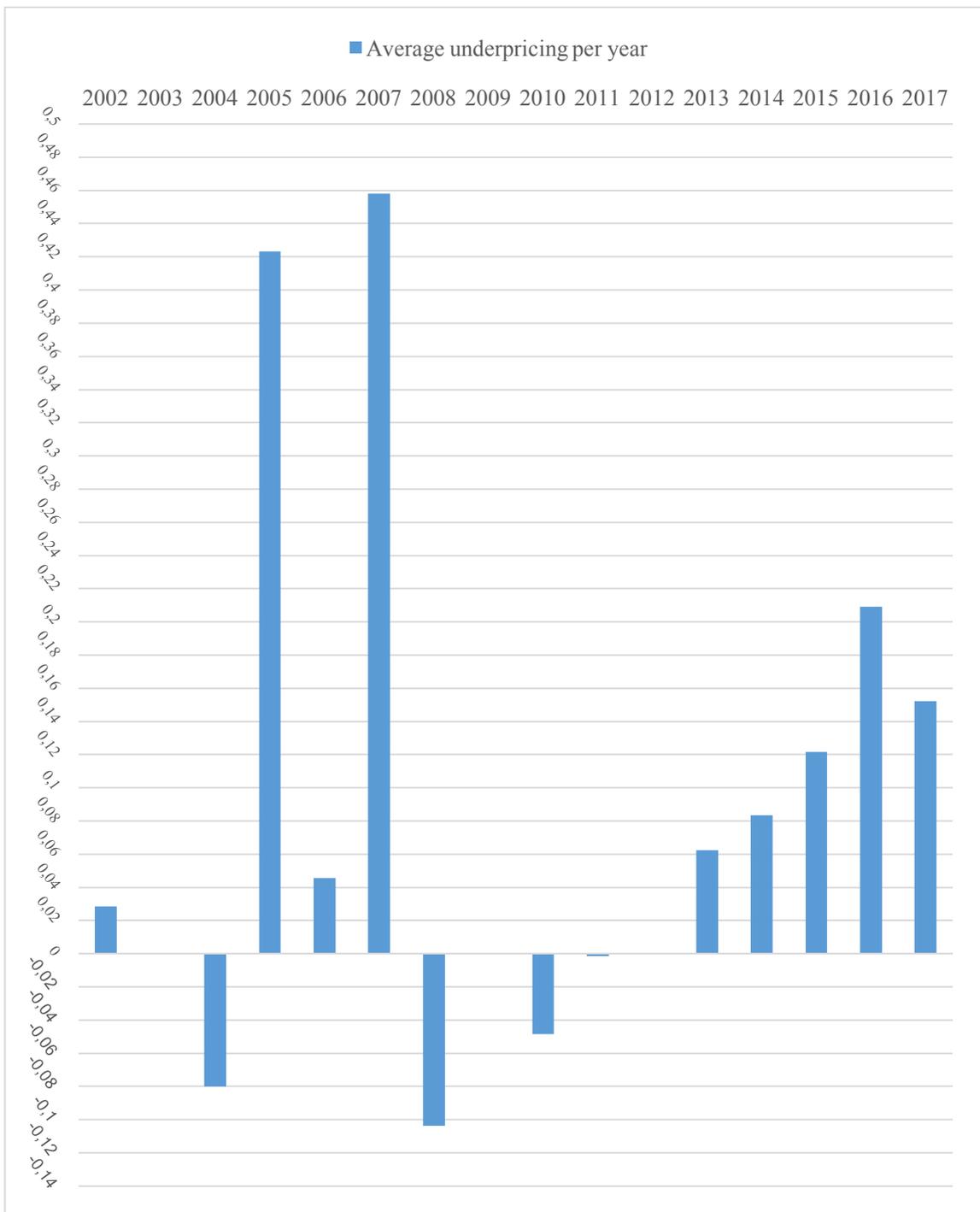


As one can see per the histogram, the sample is far from normally distributed. The positive skewness is easily observed by the two observations placed substantially further to the right of the sample. The kurtosis is also easily observable in figure. A majority of the observations are found in the interval of 0.5 and -0.5 standard residual - causing the spike in the histogram. There are critics claiming that in order for the t-statistic to work optimally the data should be normally distributed. However, as explained by the central limit theorem, means of samples from a population approach a normal distribution

if the sample size increases (Gujarati & Porter, 2009). The sample contains of 90 observations, which should be enough to satisfy the central limit theorem. As the t-test does not make assumptions about the *population* being normally distributed, non-normality can be ignored if the sample size is big enough. A common sample size is considered $n > 30$ in order for the central limit theorem to be applied.

4.1.3 Cross-sectional

Figure 2 Average underpricing per year

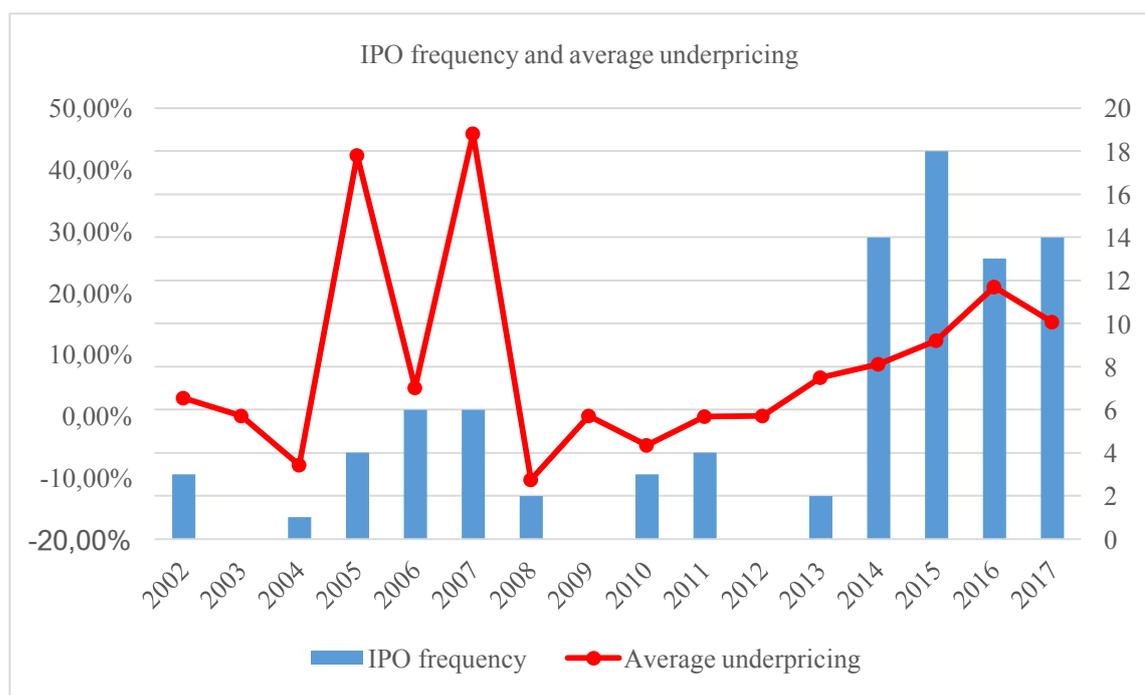


Previous studies have shown that IPO underpricing can vary greatly between different time periods. For a small IPO market like the Swedish one, too few observations might obscure the results in some years. The sample used in this thesis has three instances of years where no IPOs were issued, 2003, 2009 and 2012. From the graph there are five easily observable deviations from the common observations. There are three years where IPOs were overpriced on average, 2004, 2008 and 2010. An explanation for these uncommon mean values is that the years only had one, two and three samples respectively, causing the means to be of little relevance.

Additionally, there are two years of substantially higher underpricing compared to the common observations. Year 2005 and 2007 have mean underpricing of 42.8% and 44.8% respectively.

The reason for these deviations are a small sample combined with one single extreme value observation for each of the two years. *Whilborg fastigheter* displayed a 166.95 % MAIR in 2005 and *Vostok New Ventures SDR* had a 250.74% MAIR in 2007.

Figure 3 Comparison of IPO frequency and average underpricing



By looking at the IPO frequency and the average underpricing, one can conclude that there is no sign of significant correlation between the extent of underpricing and IPO frequency. The correlation coefficient of 0.3 is not considered to be of any significant value. When excluding the two extreme observations in year 2005 and 2007 from the sample altogether, a Pearson correlation of 0.798 is found, which is significant at the 1% level. The full Pearson correlation output can be found in appendix 5.

4.1.4 Regression

The general empirical findings of underpricing in the sample have been discussed above, this section aims to further explore the results of the regression, the variables included in the regression and the theories they were a proxy for. The statistics from each explanatory variable will be analysed as well as the regression equation in its entirety.

The regression has an R-square of 0.047 which indicates that the explanatory variables only explains 4.7% of the variation in MAIR. This implies a large amount of unexplained variance in the model. The intercept is not statistically significant: meaning that one cannot say that it is significantly different from zero. Hence, in the case where all the explanatory variables are zero, the underpricing would also be zero. This implies that zero underpricing should be expected without the research variables present, thus giving the research variables credit for explaining at least some of the underpricing.

The F-statistic of 1.41 is not statistically significant. This means that the regression coefficients, when tested simultaneously, are not statistically different from zero. Consequently, the regression model has little validity in fitting the data as the explanatory variables together have little influence on the dependent variable. A bigger sample, or a reduction in the number of explanatory variables, would probably have improved this result towards higher significance.

The expected signs of the variables did match their theory except for the case of Fsize. The variable denoted as Fsize had a positive sign, while the theory expects it to have a negative sign.

Only one explanatory variable, the *Dummy HM* showed statistical significance at the 10% level, with a t-stat of 1.909. The HM enters the regression with a positive coefficient of 0.141.

The coefficient on the *HM* variable can be interpreted as the change in underpricing when the IPO is listed during a “hot market” compared to when it has been listed in a “cold market”. That is, an IPO that has been listed during a hot market has a $0.141 = 14.1$ % points higher underpricing on average.

The full regression output can be found in appendix 6.

4.2 Underperformance

The data set for the test of underperformance consist of 34 companies from Nasdaq OMX Stockholm that were first listed on the stock exchange in 2002-2012, and are currently still listed. In the final sample companies that have been delisted and companies that had their initial public offering after the year of 2012 have been excluded, since the long run performance test required a total of five years on the stock exchange. The full dataset can be found in appendix 2.

4.2.1 Descriptive statistics

Table 5 Descriptive statistics, long-run performance (CAR)

CAR	
Number of IPOs	34
Number of underperforming IPOs	22
Number of overperforming IPOs	12
Average long-run performance	-14.5%
Highest long-run performance	112.8%
Lowest long-run performance	-217.9%
Standard deviation	73.07%
Median	-12.78%

Table 6 Descriptive statistics, long-run performance (BHAR)

BHAR	
Number of IPOs	34
Number of underperforming IPOs	22
Number of overperforming IPOs	12
Average long-run performance	-14.1%
Highest long-run performance	113.9%
Lowest long-run performance	-216.2%
Standard deviation	72.67%
Median	-12.81%

4.2.2 Statistical significance

Table 7 Statistical significance, long-run performance

	Number of IPOs	Average CAR	Average BHAR	t-Statistic CAR	t-Statistic BHAR
2002	4	12.04%	12.39%	0.3519	0.3593
2003	0	N/A	N/A	N/A	N/A
2004	3	23.83%	26.30%	0.2905	0.3252
2005	5	-30.61%	-30.82%	-1.0860	-1.0980
2006	7	-40.41%	-40.58%	-2.3638*	-2.3891**
2007	6	9.13%	9.97%	0.4269	0.4818
2008	2	-16.86%	-16.98%	N/A	N/A
2009	0	N/A	N/A	N/A	N/A
2010	3	-21.73%	-21.45%	-9.8534***	-11.0430***
2011	4	-54.16%	-53.71%	-0.9874	-0.9870
2012	0	N/A	N/A	N/A	N/A
2002-2012	34	-14.49%	-14.14%	-1.1562	-1.1343

* Significant at the 10% level.

** Significant at the 5% level

*** Significant at the 1% level

From the descriptive statistic, one can see an average long-run underperformance of -14.1%, indicating that on average, Swedish IPOs underperform the market by roughly 14% over a five-year period. However, according to the t-statistics, the long-run underperformance of IPOs is not statistically significant. This means that the null hypothesis cannot be rejected and that the mean long-run underperformance among IPOs in Sweden 2002-2011 is not different from 0. In interpreting this, one could conclude that there is no long-run underperformance based on the single factor of being an IPO-company.

5 Analysis

In this chapter the empirical results will be analysed and connected to the hypotheses. Both the general tests for both stylized facts as well as the variables from the regression will be analysed.

5.1 General test for underpricing

The results points towards rejecting the H_10 hypothesis, that is rejecting that the mean MAIR of IPOs on the Nasdaq OMX Stockholm are equal to 0. Meaning that there is statistically significant underpricing present on Nasdaq OMX Stockholm amongst IPOs listed 2002-2017. There are clear signs of IPO underpricing in Sweden, which is as expected. The average market adjusted underpricing is 13.83%. The result are statistically significant at the 1% level.

~~H_10 : The mean market – adjusted initial return (\overline{MAIR}) = 0~~

H_11 : The mean market – adjusted initial return (\overline{MAIR}) \neq 0

5.2 The effect of offer price on IPO underpricing

In order to test hypothesis three, the variable *PRICE* was included in the regression as a proxy for the signalling theory. The expectation was that the lower the price of the issue the higher the underpricing of the issue. In other words, the expected sign for the variable in the regression was negative, as per its outcome. As per the regression output, the variable of *PRICE* did not have a statistically significant effect on the MAIR. Because of the lack of statistical significance, the null hypothesis cannot be rejected and the conclusion is that offer price, and by proxy, the signalling hypothesis, does not explain a large enough part of the underpricing of IPOs on Nasdaq OMX Stockholm.

H_30 : There is no association between the level of underpricing and the *PRICE* of the issuing firm

~~H_31 : There is a negative association between the level of underpricing and the *PRICE* of the issuing firm~~

5.3 The effect of firm size on IPO underpricing

The variable of firm size was included to test for the fourth hypothesis, which was a proxy for the theory of uncertainty. The expected sign of the variable was negative, implying that the larger the size of the firm, the lower the underpricing. The uncertainty theory implies that a larger firm has less uncertainty in terms of valuation, meaning that a larger firm is easier to value with greater certainty compared to a smaller firm. Moreover, the uncertainty theory states that a larger firm has greater access to investment capital and resources, further decreasing the ex-ante IPO risk of the firm. By analysing the results of the regression, the sign of the coefficient was positive. This implies that the larger the firm, the greater the underpricing, this is in conflict with most of the prior empirical research on the effect of firm size on underpricing. Although, since the t-statistic of the variable is not significant, the null hypothesis cannot be rejected, and the conclusion is that the variable of firm size, and by proxy, the theory of valuation uncertainty, does not have a statistically significant effect on the underpricing of IPOs on the Nasdaq OMX Stockholm.

H₄0: There is no association between valuation uncertainty and the level of underpricing

~~*H₄1: There is a positive association between valuation uncertainty and the level of underpricing*~~

5.4 The effect of hot issue markets on IPO underpricing

To test the fifth hypothesis, a dummy variable denoting hot issue market was used. The expected sign of the variable was positive, indicating that if an IPO was issued during a hot market, the underpricing would be greater compared to an issue that was not issued during a hot market. The actual sign of the regression matched the expected sign according to previous theories. The results from the regression allows a rejection of the null hypothesis, and in turn acceptance of the H₅1 hypothesis. Indicating that there is a positive association between the level of underpricing and the hot issue markets. Even though the aggregated R-square of the regression model only accounts for 4.67% of the variation in MAIR, the HM variable was the only statistically significant variable in the model, which can be interpreted as HM-state having the largest influence on MAIR, amongst the variables tested for in the study. Moreover, the results show a positive coefficient of 0.141 for the HM-variable, this means that on average, an IPO issued during a hot market, is underpriced by 14.1% more compared to an IPO issued during a cold market. The data seems to support the “hot” and “cold” markets theory by Ibbotson and Jaffe (1975), as IPO underpricing seems significantly higher in periods of high IPO activity. In conclusion, one can argue that the hot market issue carries statistical significance in explaining the underpricing of IPOs on Nasdaq OMX Stockholm.

~~*H₅0: There is no association between the level of underpricing and HM — state*~~

*H₅1: There is a positive association between the level of underpricing and the HM
— state*

5.5 General test for long-run underperformance

The results points towards accepting the H_20 hypothesis, implying that the mean long-run underperformance (CAR) and (BHAR) are equal to zero. This implies that there is no statistically significant long-run underperformance amongst IPOs on Nasdaq OMX Stockholm. There is however a mean long-run underperformance of 14.1%, but the result is not statistically significant with a t-statistic of -1.13. Therefore the null hypothesis cannot be rejected. There are not sufficient evidence of any long-run underperformance amongst Swedish IPOs listed 2002-2011 when comparing to the market.

H_20 : The mean long – run perfromrance $\overline{(CAR)}$ and $\overline{(BHAR)}$ = 0

~~H_21 : The mean long – run perfromrance $\overline{(CAR)}$ and $\overline{(BHAR)}$ \neq 0~~

6 Conclusion

In the final chapter, a conclusion with regards to the research questions will be presented, together with limitations, suggestions for further research and societal and ethical implications.

The purpose of the study was to investigate to what extent the two stylized facts of underpricing and long-run underperformance exists on Nasdaq OMX Stockholm, and additionally if there exist a correlation between IPO frequency and the extent of these stylized facts.

Based on the sample in the study, the first research question; *is there underpricing of Swedish IPO's on Nasdaq OMX Stockholm?* is confirmed, there are statistically significant data that supports an average underpricing of roughly 14% during the selected time period. This is in line with previous empirical research, and well in line with the latest research done on the subject on the Swedish market by Bodnaruk, Kandal Massa and Simonov (2008), Isaksson et. al (2014) and Abrahamson & De Ridder (2015), who found an average underpricing ranging from 7-15%.

In order to answer the second research question; *Does IPO underpricing have a correlation to IPO frequency?* A decision of including outliers from the sample or not needs to be done. If the outliers are included, there is not a significant Pearson correlation between underpricing and IPO frequency. If they are not, there is a significant correlation at the 1%-level of 0.798. This implies a strong correlation between underpricing and IPO frequency. When weighing these evidence, and excluding the outliers, one can conclude that there is a large possibility that the IPO frequency has an impact on the extent of IPO underpricing.

There is not sufficient evidence from the study to conclude a positive response to the third research question; *Is there an occurrence of long-term underperformance of Swedish IPO's on Nasdaq OMX Stockholm?* In other words, there is not sufficient data to support any long-run underperformance of Swedish IPO's. Even though there was an average long-run underperformance of 14%, the result was not statistically significant at any level. Which leads us to conclude that the mean long-run underperformance is not different from 0.

Bearing the answer to the third research question in mind, the forth one; *Does IPO long-term underperformance have a correlation to IPO frequency?* Can easily and concisely be answered. Since there is no significant long-run underperformance present, there cannot be a correlation with IPO frequency.

From the analysis of the study, there is no strong explanation for the presence of underpricing linked to previous theory, and the theories tested for did not indicate any strong statistical significance. This leads to the conclusion that deriving and testing for the causes of underpricing is difficult, time-consuming and perhaps better suited for doctoral researchers and the like, who are able to perform more elaborate research without time constraints.

The findings prove that the selected theories do not do a very good job of explaining the observed underpricing of IPOs on Nasdaq OMX Stockholm. There is no support found for the uncertainty hypothesis suggested by Beatty and Ritter (1986), nor for the signalling hypothesis by Ibbotson (1975). The only tested theory that showed some statistical significance was the Hot Issue market theory by Ibbotson and Jaffe (1975), although the significance was moderate, it could still be an explanation for some of the underpricing of IPOs on Nasdaq OMX Stockholm.

6.1 Limitations

The research conducted in this study gives little support to the selected underpricing theories as well as support for the existence of long-run underperformance among IPOs in Sweden. The theories tested for in this thesis have shown to hold in other studies performed on other markets. There might be a variety of reasons for why there is no support for theories which other authors find to hold on other geographical markets.

Firstly, there might be limitations to the proxy variables used in the regression. There might be proxies that are better suited for the different theories researched. If e.g. the offer price does not properly capture the effects of signalling, the research might have been affected.

Moreover, the data sample might limit the findings of the study. A potential source of error is the eliminations of observations where an IPO prospectus could not be found. If there is a general trend to the companies that lack prospectuses, e.g. if only smaller companies lack prospectus, the sample could have been affected. Another limitation related to data and the sample is the size of the Swedish IPO market, and the delimitation that the authors could only find data for the Nasdaq OMX Stockholm. Since many of the research variables had the correct sign in the regression according to theory, a larger sample might have led to an increase in the significance in both underpricing and long-run underperformance. Hence, the disagreements towards the support of the different theories might be due to the size of the stock market in question and the size of the sample. Furthermore, it should be noted that that the theories tested for in the study were initially tested on the larger U.S. IPO market, where the number of observations were more than enough to get significant results.

The theories researched in the study were picked among the most popular and supported once, but limited to those that were possible to research with the available data. This might have caused more popular and widely supported theories not being researched due to lack of proper financial data. Hence, it is likely that the regression model is under fitted, as some of the theories that were not selected could explain a great deal of the observed underpricing. However, researching all the theories in combination with examining for the actual occurrence of both the stylized facts of underpricing and long-run underperformance would have been far outside the scope and timeframe of the thesis. In addition, specialized or confidential data would have been necessary.

Lastly, the adjusted underpricing calculation and the long-run performance calculations might not be perfect measures of IPO underpricing and long-run underperformance. For example, the assumption of a beta of one between the individual IPOs and the OMXS30 can have biased the calculation. The same applies for the long-run performance calculations and the assumed beta of one between the individual IPO and their corresponding industry indices. If the true beta value is larger than one, the underpricing estimates will be slightly overestimated during positive market movements, and slightly underestimated during negative market movements. The same applies to the long-run performance calculations.

Altogether, there are many potential limitations to the findings in this thesis, as is common in most types of research. The results of this study should therefore be seen in the light of these possible limitations.

6.2 Further research

As previously mentioned, there are many theories and causes of underpricing and long-run underperformance among IPOs not tested for in this thesis. Furthermore, a study that could be of interest to research further in regard to the Swedish IPO market and underpricing would be the investor sentiment theory. The investor sentiment theory can be defined as a belief about future cash flows and risks regarding investment which is not fully justified by the currently available facts (Baker & Wurgler, 2007).

For example, an investor sentiment index could have been created and used as a variable in testing whether investor sentiment drives Swedish underpricing. A Swedish sentiment index would probably be a more efficient proxy for Swedish sentiment than the U.S sentiment index described by the authors Baker and Wurgler (2006). However, further research on the examination of sentiment theory on the Swedish IPO market could include business or consumer confidence figures to be used as a proxy for Swedish sentiment.

Even though examining existing underpricing theories is giving, a lot of factors points towards that the true cause of underpricing is still undiscovered. Therefore, there is room for newly developed theories that eventually can explain the true cause of underpricing in Sweden and overseas.

Furthermore, further research could both broaden and detail the research by including the full population of Swedish IPOs and also gain more detailed knowledge by examine the stylized facts within specific sectors.

6.3 Societal and ethical implications

When considering the societal and ethical implications of IPO underpricing. The parties effected are mainly the pre-IPO shareholders and naturally, the post-IPO owners. The IPO underpricing phenomenon implies that companies and pre-IPO shareholders generally are negatively affected by the relatively lower price set in IPOs, while new investors benefit from the lower price. Companies affected by high underpricing could have raised more capital by increasing the offer price and thereby avoiding leaving money on the table. Pre-IPO shareholders are also monetarily hurt by relatively lower prices in secondary offerings as their ownership would have been worth more with higher IPO offer prices. IPO investors benefit from underpricing as they exploit the opportunity to invest in an instrument that on average will yield high positive returns in a short time frame. On the face of it, this might seem unethical. However, it is important to remember that the investors of the IPOs are bearing a financial risk in investing in IPOs, and need to be compensated for that risk by retrieving a positive return, otherwise many investors would probably be reluctant to invest in IPOs from the very beginning.

Furthermore, the authors hope that this research have contributed to an increase in knowledge of IPOs both amongst investors and corporate management, in order to make educated decisions in regards of IPOs and thus, improve their economic decisions and economic wellbeing in general.

Lastly an increased understanding of IPOs, deepens the knowledge of the stock market in general and further improves the ability for corporations and individuals to gain economic profit from the financial system.

7 Reference list

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Appendix 1 Underpricing sample

Name	IR	MAIR	WR	IPO year
ACADEMEDIA	47.5%	45.16%	1.42	2016
ACTIC GROUP	1.0%	0.63%	1.00	2017
ADDLIFE	80.3%	81.10%	1.83	2016
AHLSSELL	21.74%	21.55%	1.21	2016
ALFA LAVAL	5.95%	7.30%	1.09	2002
ALIMAK GROUP	15.71%	16.65%	1.18	2015
AMBEA	10.0%	9.76%	1.10	2017
ARISE	-2.27%	-1.98%	0.98	2010
ATTENDO	40.00%	39.08%	1.38	2015
BACTIGUARD HOLD	-17.11%	-17.66%	0.82	2014
BALCO GROUP	17.0%	16.20%	1.15	2017
BE GROUP	4.8%	6.56%	1.08	2006
BESQAB PROJEKT & FASTIGH	15.8%	15.94%	1.16	2014
BIOARCTIC	20.83%	20.65%	1.20	2017
BONESUPPORT HOLDING	10.34%	10.71%	1.11	2017
BOOZT	25.00%	25.04%	1.25	2017
BOULE DIAGNOSTICS (WI)	0.0%	0.59%	1.01	2011
BRAVIDA HOLDING	7.50%	7.60%	1.08	2015
BUFAB	6.52%	5.98%	1.05	2014
BULTEN	0.00%	-0.11%	1.00	2011
BYGGMAX GROUP	-5.8%	-6.69%	0.93	2010
CAMURUS	15.8%	17.86%	1.20	2015
CAPIO	0.0%	0.54%	1.01	2015
CLX COMMUNICATIONS	27.12%	26.26%	1.25	2015
COLLECTOR	15.64%	14.23%	1.13	2015
COM HEM HOLDINGS	9.57%	9.48%	1.09	2014
COOR SERVICE MAN.	0.0%	-0.08%	1.00	2015
DIOS FASTIGHETER	-7.74%	-8.09%	0.92	2006
DOMETIC GROUP	15.42%	14.24%	1.13	2015
DUNI	0.00%	1.68%	1.03	2007
DUSTIN GROUP	17.0%	15.92%	1.15	2015
EASTNINE	1.5%	4.19%	1.07	2007
EDGEWARE	1.7%	0.80%	1.00	2016
ELTEL	7.35%	6.51%	1.06	2015
FM MATTSSON MORA GROUP	33.82%	33.92%	1.34	2017
GARO	39.73%	40.50%	1.42	2016
GHP SPECIALTY CARE	-1.4%	-3.80%	0.94	2008
GRANGES	2.35%	3.87%	1.05	2014
HANDICARE GROUP	10.00%	10.22%	1.10	2017
HEMFOSA FASTIGHETER	4.84%	4.92%	1.05	2014
HMS NETWORKS	-1.4%	0.15%	1.02	2007
HOIST FINANCE	14.0%	14.37%	1.15	2015
HUMANA	19.4%	19.00%	1.19	2016
ICA GRUPPEN	5.84%	5.18%	1.04	2005
IMMUNICUM	6.25%	6.60%	1.07	2013
INSTALCO INTRESSENER	18.18%	18.65%	1.19	2017
INTERNATIONELLA ENGELSKA SKOLAN I SV	32.7%	32.02%	1.31	2016
INTRUM JUSTITIA	6.38%	8.21%	1.10	2002
INWIDO	-5.15%	-5.37%	0.94	2014
KAPPAHL	4.91%	4.85%	1.05	2006
KAROLINSKA DEVELOPMENT (WI)	0.0%	-0.97%	0.98	2011
LIFCO B	32.3%	30.60%	1.28	2014

LINDAB INTERNATIONAL	2.5%	3.27%	1.04	2006
LUNDIN GOLD (OME)	3.79%	3.14%	1.02	2014
MEDICOVER B	16.96%	17.38%	1.18	2017
MIPS	11.96%	10.79%	1.10	2017
MOBERG PHARMA	-1.0%	-0.03%	1.01	2011
MQ HOLDING	-5.07%	-5.84%	0.93	2010
MUNTERS GROUP	20.09%	19.23%	1.18	2017
NEDERMAN HOLDING	17.18%	17.05%	1.17	2007
NEUROVIVE PHARMACEUTICAL	-14.5%	-16.90%	0.81	2008
NOBIA	-9.0%	-6.91%	0.95	2002
NOBINA	-5.9%	-5.56%	0.95	2015
NORDAX GROUP	-2.44%	-1.51%	0.99	2015
NORDIC WATERPROOFING HOLDING	0.70%	2.88%	1.05	2016
NOTE	-8.00%	-8.00%	0.92	2004
NP3 FASTIGHETER	12.7%	13.84%	1.15	2014
ONCOPEPTIDES	-6.52%	-6.02%	0.94	2017
OREXO	-7.69%	-7.88%	0.92	2005
OSCAR PROPERTIES	13.00%	12.53%	1.12	2014
PANDOX	1.0%	1.36%	1.02	2015
PLATZER FASTIGHETER	5.3%	5.85%	1.06	2013
RECIPHARM AB	9.9%	10.56%	1.11	2014
RESURS HOLDING	0.18%	2.28%	1.04	2016
REZIDOR HOTEL GROUP	9.47%	9.12%	1.09	2006
SCANDI STANDARD	17.50%	17.02%	1.16	2014
SCANDIC HOTELS GROUP	-4.9%	-5.07%	0.95	2015
SERNEKE GROUP	0.00%	1.17%	1.02	2016
SSM HOLDING	-0.85%	-1.20%	0.98	2017
SWEDISH ORPHAN BIOVITRUM	11.50%	11.73%	1.12	2006
SYSTEMAIR	0.0%	1.05%	1.02	2007
TF BANK	10.4%	11.99%	1.14	2016
THULE GROUP	11.4%	12.08%	1.13	2014
TOBII AB	38.00%	37.48%	1.37	2015
TRADEDOUBLER	4.76%	5.02%	1.05	2005
TROAX GROUP	19.32%	20.10%	1.21	2015
WIHLBORGS FASTIGHETER	166.9%	166.95%	2.67	2005
WILSON THERAPEUTICS	0.00%	-0.11%	1.00	2016
VOLATI	15.09%	14.14%	1.13	2016
VOSTOK NEW VENTURES SDR	251.14%	250.74%	3.49	2007

Appendix 2 Long-run sample

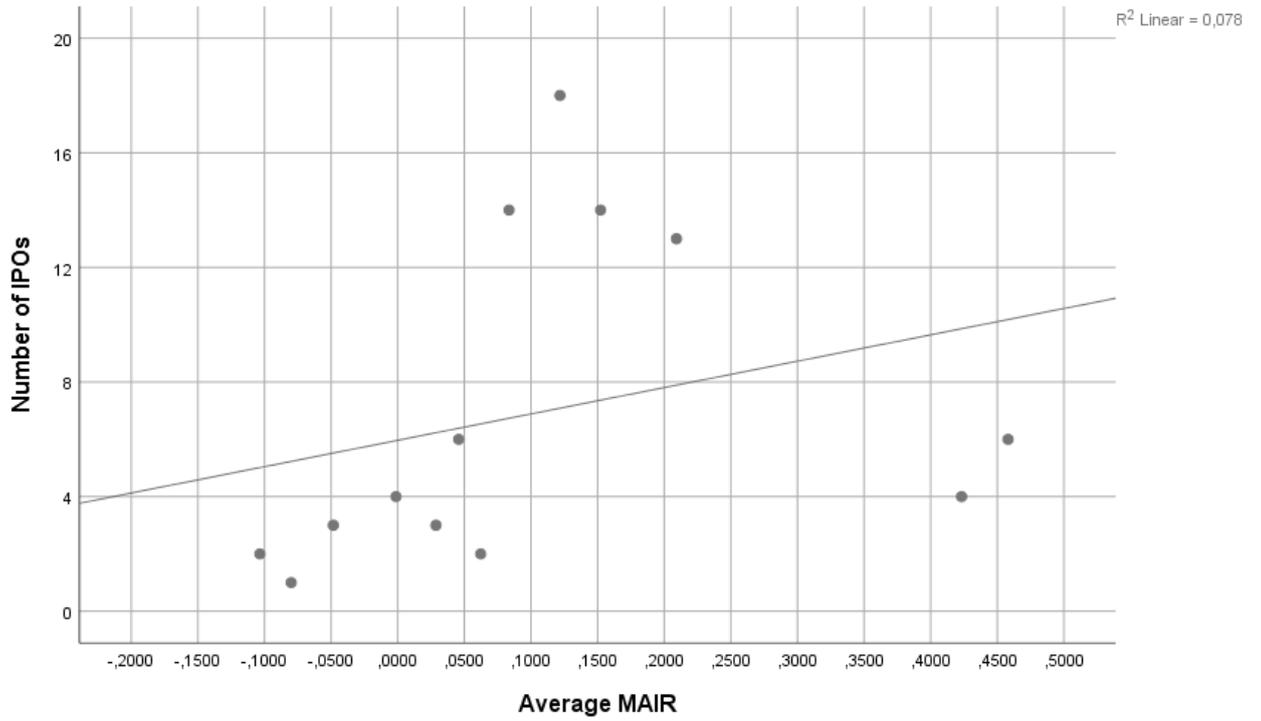
Name	CAR	BHAR	IPO year
ALFA LAVAL	-40.3%	-40.2%	2002
ARISE	-17.8%	-17.7%	2010
BE GROUP	-48.4%	-47.5%	2006
BOULE DIAGNOSTICS (WI)	14.5%	13.4%	2011
BULTEN	-0.8%	-0.1%	2011
BYGGMAX GROUP	-22.1%	-22.6%	2010
CATENA	16.6%	13.4%	2006
DIOS FASTIGHETER	-2.4%	-1.5%	2006
DUNI	2.5%	0.6%	2007
EASTNINE	-58.6%	-52.4%	2007
GHP SPECIALTY CARE	-121.7%	-121.8%	2008
HMS NETWORKS	83.5%	82.6%	2007
ICA GRUPPEN	-13.1%	-11.1%	2005
INDUTRADE	53.8%	51.5%	2005
INTRUM JUSTITIA	-12.0%	-10.3%	2002
KAPPAHL	-45.8%	-46.2%	2006
KAROLINSKA DEVELOPMENT (WI)	-217.9%	-216.2%	2011
KINDRED GROUP SDR	146.1%	147.6%	2004
KLOVERN A	-12.3%	-13.8%	2002
LINDAB INTERNATIONAL	-117.6%	-118.0%	2006
MILLICOM INTL.CELU.SDR	57.5%	58.3%	2004
MOBERG PHARMA	-12.4%	-11.9%	2011
MQ HOLDING	-25.4%	-24.1%	2010
NEDERMAN HOLDING	49.5%	51.3%	2007
NEUROVIVE PHARMACEUTICAL	88.0%	87.9%	2008
NOBIA	112.8%	113.9%	2002
NOTE	-132.1%	-127.0%	2004
OREXO	-80.4%	-79.7%	2005
REZIDOR HOTEL GROUP	-15.1%	-13.7%	2006
SWEDISH ORPHAN BIOVITRUM	-70.2%	-70.5%	2006
SYSTEMAIR	12.5%	11.2%	2007
TRADEDOUBLER	-73.1%	-76.0%	2005
WIHLBORGS FASTIGHETER	44.2%	43.4%	2005
VOSTOK NEW VENTURES SDR	-34.7%	-33.5%	2007

Appendix 3 MAIR and CAR/BHAR comparison

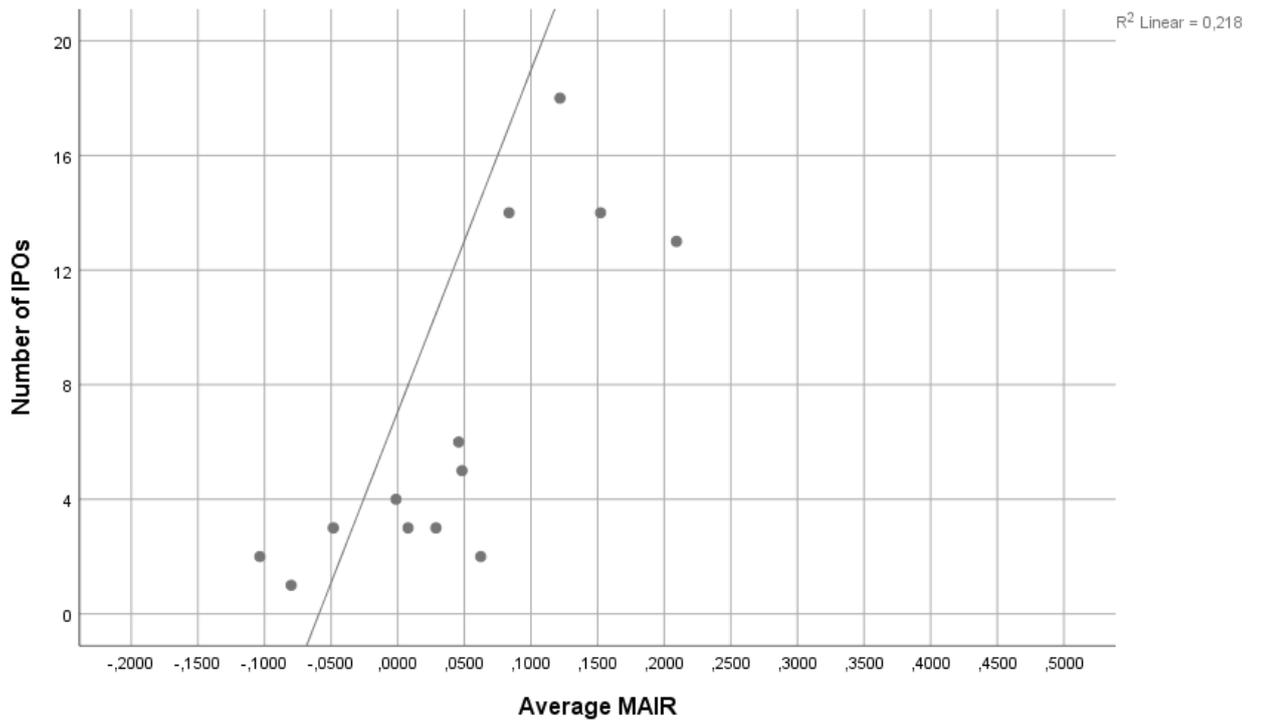
Name	MAIR	CAR	BHAR
ALFA LAVAL	7.30%	-40.3%	-40.2%
ARISE	-1.98%	-17.8%	-17.7%
BE GROUP	6.56%	-48.4%	-47.5%
BOULE DIAGNOSTICS (WI)	0.59%	14.5%	13.4%
BULTEN	-0.11%	-0.8%	-0.1%
BYGGMAX GROUP	-6.69%	-22.1%	-22.6%
DIOS FASTIGHETER	-8.09%	-2.4%	-1.5%
DUNI	1.68%	2.5%	0.6%
EASTNINE	4.19%	-58.6%	-52.4%
GHP SPECIALTY CARE	-3.80%	-121.7%	-121.8%
HMS NETWORKS	0.15%	83.5%	82.6%
ICA GRUPPEN	5.18%	-13.1%	-11.1%
INTRUM JUSTITIA	8.21%	-12.0%	-10.3%
KAPPAHL	4.85%	-45.8%	-46.2%
KAROLINSKA DEVELOPMENT (WI)	-0.97%	-217.9%	-216.2%
LINDAB INTERNATIONAL	3.27%	-117.6%	-118.0%
MOBERG PHARMA	-0.03%	-12.4%	-11.9%
MQ HOLDING	-5.84%	-25.4%	-24.1%
NEDERMAN HOLDING	17.05%	49.5%	51.3%
NEUROVIVE PHARMACEUTICAL	-16.90%	88.0%	87.9%
NOBIA	-6.91%	112.8%	113.9%
NOTE	-8.00%	-132.1%	-127.0%
OREXO	-7.88%	-80.4%	-79.7%
REZIDOR HOTEL GROUP	9.12%	-15.1%	-13.7%
SWEDISH ORPHAN BIOVITRUM	11.73%	-70.2%	-70.5%
SYSTEMAIR	1.05%	12.5%	11.2%
TRADEDOUBLER	5.02%	-73.1%	-76.0%
WIHLBORGS FASTIGHETER	166.95%	44.2%	43.4%
VOSTOK NEW VENTURES SDR	250.74%	-34.7%	-33.5%

Scatter plot w/ extreme values

Appendix 4 Scatter plots with and without extreme values



Scatter plot w/o extreme values



Appendix 5 Pearson correlation

Pearson correlations w/ extreme values

		Correlations	
		Number of IPOs	Average MAIR
Number of IPOs	Pearson Correlation	1	.280
	Sig. (2-tailed)		.355
	N	13	13
Average MAIR	Pearson Correlation	.280	1
	Sig. (2-tailed)	.355	
	N	13	13

Pearson correlation w/o extreme values

		Correlations	
		Number of IPOs	Average MAIR
Number of IPOs	Pearson Correlation	1	.798**
	Sig. (2-tailed)		.001
	N	13	13
Average MAIR	Pearson Correlation	.798**	1
	Sig. (2-tailed)	.001	
	N	13	13

** . Correlation is significant at the 0.01 level (2-tailed).

Appendix 6 Regression output

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.217 ^a	.047	.014	.332444205173 627

a. Predictors: (Constant), Firm size (Assets MSEK), Dummy variables HM, Offer price

b. Dependent Variable: MAIR

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.468	3	.156	1.412	.245 ^b
	Residual	9.505	86	.111		
	Total	9.973	89			

a. Dependent Variable: MAIR

b. Predictors: (Constant), Firm size (Assets MSEK), Dummy variables HM, Offer price

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	.154	.098		1.570	.120	-.041	.350		
	Dummy variables HM	.141	.074	.204	1.909	.060	-.006	.287	.947	1.027
	Offer price	-.001	.002	-.096	-.901	.370	-.005	.002	.967	1.034
	Firm size (Assets MSEK)	2.858E-6	.000	.049	.455	.650	.000	.000	.949	1.054

a. Dependent Variable: MAIR

