



IPO UNDERPRICING AND PERFORMANCE IN THE HELSINKI AND STOCKHOLM STOCK  
EXCHANGE DURING 2015-H1/2021

Lappeenranta–Lahti University of Technology LUT

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Mikko Laine

Examiner: Sheraz Ahmed

## ABSTRACT

Lappeenranta–Lahti University of Technology LUT

School of Business and Management

Business Administration

Mikko Laine

### **IPO Underpricing and Performance in the Helsinki and Stockholm Stock Exchange During 2015-H1/2021**

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Nordic initial public offerings have been under heavy public hype and media attention during the last few years. The strong bull market seen after the market crash caused by the COVID-19 pandemic has accelerated the Nordic IPO markets in an unprecedented way. The rate of IPOs in 2021 hit a yearly record in both the Finnish and Swedish stock markets. This thesis examines IPO underpricing, long-term price performance as well as short-term price performance in relation to the risk of companies listed on the Helsinki and Stockholm stock exchanges. The timeframe of the study starts from the beginning of 2015 and ends at the end of the first half of 2021. The sample of the thesis consists of 315 companies listed on the Helsinki and Stockholm stock exchanges.

The abnormal returns of the first day related to the IPOs have been a focus of academic research for several decades. This study aims to find out how different company and listing characteristics impact the magnitude of underpricing. For this purpose, a linear regression analysis is conducted between the initial return of the first day and different explanatory variables. The study also aims to examine the longer-term performance of the listed companies. This is done by conducting portfolios and comparing their performance to the returns of the markets. Lastly, the study aims to measure the short-term price performance of IPO stocks in relation to risk, for which the Sharpe ratio is utilized.

The results of the linear regression models indicate that the explanatory variables used in the study explain the degree of underpricing moderately well. However, the explanatory power of the model could have been considerably higher with the addition of other variables. The longer-term price performance of the companies, on the other hand, beat the market returns with each portfolio conducted, which is mainly due to the contribution of singular stocks that had exceptionally high returns. The Finnish portfolios were also superior to the Swedish ones. The short-term price performance in relation to risk remains quite weak; none of the mean values of the Sharpe exceed the generally accepted threshold for a good Sharpe. However, Finnish IPO stocks performed better in relation to risk than Swedish ones.

## TIIVISTELMÄ

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Kauppatieteet

Mikko Laine

### **Listautumisanti alihinnoittelu sekä suoriutuminen Helsingin ja Tukholman osakemarkkinoilla vuosina 2015-H1/2021**

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Pohjoismaiset listautumisannit ovat viime vuosina olleet kovan julkisen hehkutuksen sekä mediahuomion alla. Erityisesti koronaviruspandemian aiheuttaman markkinaromahduksen jälkeinen vahva härkämarkkina on kiihdyttänyt pohjoismaisia listautumismarkkinoita poikkeuksellisen nopeasti. Tämä tutkielma tarkastelee Helsingin ja Tukholman pörssiin listautuvien yhtiöiden alihinnoittelua, pidemmän aikavälin hintakehitystä sekä lyhyen aikavälin hinnoittelua suhteessa riskiin. Tutkimuksen aikaväli alkaa vuoden 2015 alusta ja päättyy vuoden 2021 puoliväliin. Tutkimusaineisto koostuu 315 kappaleesta Helsingin sekä Tukholman pörssiin listatusta yhtiöstä.

Listautumisanteihin liittyvät ensimmäisen päivän epänormaalit tuotot ovat olleet akateemisen tutkimuksen huomion alla jo useita vuosikymmeniä. Tässä tutkimuksessa pyritään selvittämään miten yhtiöön sekä itse listautumisen liittyvät tekijät vaikuttavat alihinnoittelun suuruuteen. Tätä varten suoritetaan lineaarinen regressioanalyysi ensimmäisen päivän tuoton sekä listautumisantia vastaavan markkinatuoton, yhtiön iän, toimialan, markkinapaikan, jolle yhtiö listautuu sekä listautumishetken ajankohdan välille. Tutkimuksessa tarkastellaan myös listautujien pidemmän ajan hintakehitystä. Tätä tarkastellaan kokoamalla osakkeista portfoliot, joiden tuottoja vertaillaan saman aikavälin markkinoiden tuottoihin. Viimeiseksi tutkimuksessa pyritään mittaamaan listautujien lyhyen aikavälin suoriutumista suhteessa riskiin Sharpen luvun avulla.

Lineaarisen regressiomallien tulokset osoittavat, että tutkimuksessa käytetyt muuttujat selittävät alihinnoittelun suuruutta kohtalaisen hyvin. Muuttujat, joita ei hyödynnetty tutkimuksessa saattaisivat tosin selittää ensimmäisen päivän ylituottoja vielä merkittävästi paremmin. Yhtiöiden pidemmän aikavälin hintakehitys taas voittaa markkinoiden tuoton jokaisella muodostetulla portfoliolla. Tätä myötävaikuttaa yksittäisten osakkeiden poikkeuksellisen suuret tuotot. Suomen osakkeista koostuvat portfoliot suoriutuivat myös paremmin Ruotsin vastaaviin nähden. Lyhyen aikavälin riskihinnoittelu taas jää varsin heikoksi; yksikään keskimääräinen Sharpen luku ei ylitä yleisesti hyväksyttyä hyvän Sharpen raja-arvoa. Suomalaiset osakkeet tosin suoriutuivat riskiin nähden Ruotsalaisia osakkeita paremmin.

## LIST OF ABBREVIATIONS

AMEX	American Stock Exchange
DAFOX	German Stock Price Research Index
EMH	Efficient Market Hypothesis
IFRS	International Financial Reporting Standards
IPO	Initial Public Offering
IR	Initial Return
NYSE	New York Stock Exchange
OLS	Ordinary Least Squares
OMXHBCAPGI	OMX Helsinki Benchmark Cap Gross Index
OMXSBCAPGI	OMX Stockholm Benchmark Cap Gross Index
SPAC	Special Purpose Acquisition Company

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## 1. Introduction

An initial public offering (IPO) is a process in which a private company has its shares listed to the public for the first time. It is done by a sale of shares by the existing owners, by an issue of new shares, or by a combination of both. An IPO is one of the most common methods for a company to accumulate equity and expand its ownership. It is simultaneously an opportunity for a company to increase its conspicuousness among investors and the financial industry. From an investor's standpoint, subscribing to IPOs has been an attractive investing strategy for their continuous possibility to make abnormal returns. However, this anomaly is often driven by irrational factors such as collective excitement and human emotions. The high demand for the newly issued shares often leads to a significant return on the day of trading, resulting in an underpricing phenomenon. The phenomenon occurs, when the exchange quotation of a newly issued share is higher at the closing of the first trading day than the initial offer price. The degree of underpricing can be calculated as a percentage difference in the initial offering price in relation to the first trading day closing price.

The underpricing phenomenon has inspired a large amount of academic literature over multiple decades. According to Ritter & Welch (2002), the academic literature can be considered to have originated in the early 1970s. The literature has come up with multiple causes for the IPO underpricing. As presented by Rock (1986), asymmetrical information among investors, an issuing company, and an underwriter is a common cause for underpricing. Rock (1986) proposed another theory in which the issuing firm in cooperation with an underwriter might deliberately set the issue price lower and 'leave money on the table' to attract uninformed investors. The issuing firm might also deliberately underprice the IPO to generate positive market feedback on the issue or even to signal the issuing company's quality (Bommel, 2002; Allen & Faulhaber, 1989).

The number of IPOs in the Nordic markets has been gradually increasing from the recession resultant of the financial crisis. The recovery of the markets alongside the introduction of the First North growth list has accelerated the rates of IPOs during the last decades. The First North lists have enabled smaller companies focusing on growth to raise equity with a smaller amount of regulation. As on the main list, the companies listed on the First North are likewise subject to public trading. The major bull run seen after the crash caused by the Covid-19 pandemic has also sped up the rates of IPOs. According to Ibbotson & Jaffe (1975), investors favor IPOs in periods of high market yields, which somewhat explains the IPO activity of recent years. The degree of underpricing also inflates as the number of IPOs gets higher. In the first half of 2021, there were a total of 64 new IPOs included in the sample. The number surpasses the amount of IPOs in the sample in the entire 2019 and 2020 combined. The overall listing activity in the Nordic countries differs from one another, with the Swedish stock market having by far the highest activity (Pörssisäätiö, 2021).

### 1.1. Research objectives and research questions

The study aims to find out how a responsive market return, the age of a company, the sector the company operates in, the point of time in a year the company goes public, and the market the company goes public on, impact the magnitude of underpricing. For this purpose, a linear regression analysis is performed between the initial return of the first day and different explanatory variables. The model is conducted for independently for both the Finnish and Swedish IPOs to take possible country-specific differences into consideration. The study also aims to examine the longer-term performance of the listed companies. This is done by conducting portfolios and comparing their performance to the returns of the markets. Lastly, the study aims to measure the short-term performance of IPO stocks in relation to risk, for which the Sharpe ratio is utilized.

The research questions of the study are as follows:

- *How do the different company and listing characteristics influence the magnitude of IPO underpricing in the stock exchanges of Finland and Sweden?*
- *How have the newly listed companies in the Finnish and Swedish stock exchanges performed in comparison to their respective market indices during 2015-H1/2021?*
- *How have the newly listed companies in the Finnish and Swedish stock exchanges performed in relation to risk a week, a month, and three months post-IPO during 2015-H1/2021?*

## 1.2. Research limitations

The Nasdaq Nordic consists of four different stock exchanges, two of which will be considered in this study. Nasdaq Iceland and Nasdaq Copenhagen are excluded to focus primarily on the differences in performance between the IPOs in Finland and Sweden. The differences might be due to cultural differences or differences in listing practices. On the contrary, the economic and social structures of the countries are quite similar, making it reasonable to combine the data of the two. Both the main and the First North Growth lists are included to have an adequate sample size and to determine the impacts of market choice on underpricing. The sample of companies used in the study consists of only those issuing an initial public offering. In total, the sample of the study consists of 315 companies. The mentioned number does not refer to the total number of issues or listings within the timeframe. Companies conducting dual listings, moving from other stock exchanges, or moving from the First North to the main list are not included in the sample. This is crucial since the underpricing phenomenon does not occur within market moves and including them could at worst skew the results of the study. Spin-off companies, SPACs, delisted companies, and companies with no data available are not included either for the reasons mentioned above.

The timeframe of the study will be confined from 2015 to the first half of 2021. The selection is based on the significantly high IPO activity starting in 2015. The selected timeframe also includes a noticeable decline in the listing activity, which will make the results of the study more comprehensive. The first half of 2021 is included since the market saw a notable bull run alongside exceptionally high IPO activity. The IPOs included in the sample from the first half of 2021 exceed the quantity of the entire 2020 sample by more than two times.

### 1.3. Research structure

The first paragraph introduces the reader to the subject of the research. It will also review the research objectives, questions, and limitations necessary to the study. The second chapter presents the theoretical framework of the study. It starts by presenting different results of previous academic literature considering IPO underpricing alongside longer-term performance. The chapter introduces different motives for going public and a profound look at the IPO process itself. This is followed by a review of the most notable theories and terminology considering the underpricing phenomenon. The third chapter addresses the material and data subject to the research. It will also address the methods of carrying out the empirical portion of the study. The fourth chapter considers and discusses the empirical findings of the study. Conclusions of the study results are presented in the fifth chapter.

## 2. Theoretical framework

The theoretical framework part presents essential academic literature considering IPO underpricing and the causes behind the phenomenon. Evidence on underpricing as well as long-term IPO performance is presented in the literature review. A closer look at a company's motives for going public as well as relevant steps involved in the IPO process is also considered.

### 2.1. Literature review

IPOs have been a largely researched topic for multiple decades now. The underpricing has been the most visible phenomenon mainly for the continuous possibilities for short-term excess returns. According to most of the previous research from various decades and locations, IPOs are generally underpriced. The literature review digs into the results of previous research considering IPO underpricing alongside a longer-run performance from different market periods. The results are considered from various stock exchanges and decades. Reilly & Hatfield (1969) were one of the first to research the underpricing phenomenon. They examined the initial day returns of 53 company listings in the U.S. stock market and got an average price increase of 9.9%.

Loughran et al. (2021) conducted a study on the initial day returns in different geographical locations. The study is assembled based on the findings of various studies over the years. The highest first-day returns were in the United Arab Emirates during 2003-2010 with an average return of 270.1%. Saudi Arabia is another exceptional example with an average return of 239.8% during 2003-2011. The mentioned returns are exceptional compared to most of the findings; the average returns range between 10-30%. For example, the average initial day return in Finland during 1971-2018 was 14.2% and in Sweden during 1980-2015 was 25.9%.

Based on the findings by Ritter (1984) the IPOs during periods of hot markets yielded significantly higher first-day returns in comparison to periods of cold markets. The “Hot market” theory is further complemented by a study conducted by Loughran & Ritter (2004), that found substantial differences in the degree of underpricing during different market periods. The findings of the study further compliment the “Hot market” theory and show an average first-day return of 65% during the latest years before the “dot-com bubble” and only a return of 12% during 2001-2003, during and after the market crash.

Chambers & Dimson (2009) investigated IPO underpricing of stocks listed in the London Stock Exchange over a very long time. The study had a sample consisting of 4540 IPOs and placings from the years 1917-2007. The timeframe is divided into multiple different periods. Out of all the decades studied, the highest observation of average underpricing was noticed in 2000-2007 with a value of 19,86 %. The average value of underpricing in 1930-1939 was 5,43 % which in turn, was the lowest observation out of all the decades. Regarding the whole dataset, the average value of underpricing was 14,57 %.

The long-run performance of newly listed stocks has also been in the spotlight of academic literature for quite some time. According to previous research, stocks generally outperform the market indices up to a year following the IPO. However, after the first year, the stocks tend to start to underperform. Loughran & Ritter (1995) conducted a study on the long-term performance of U.S. initial public offerings. The sample consisted of 4753 companies going public on NYSE, AMEX, and Nasdaq during 1970-1990. The so-called buy-and-hold returns are defined by using the first-day closing price as the purchase price and the closing price of the period as the sale price. The performance of the companies going public was compared by purchasing corresponding non issuing firms. They were chosen based on size to match the size of the issuing firm and bought at the same time. Both the firms going public and the nonissuing firms were hold for 5 years. The average buy-and-hold return for the companies going public was 15,7 %. For the nonissuing firms, the corresponding return was 66,4 %.

Ljungqvist (1997) researched the long-term performance of German IPOs with a sample consisting of 189 companies from the years 1970-1993. Each of the stock were held for three years and compared against the DAFOX value-weighted total return index consisting of German stocks. The results show an average return of 19,85 % against the index. The first day returns have been excluded from the calculations. According to the study conclusions, the performance of the newly listed companies is comparable to the performance of a market index for around a year post-IPO. However, returns for holding periods longer than three years would turn out negative in relation to the market.

Westerholm (2006) studied the annual returns of Finnish, Swedish, Danish and Norwegian IPO stocks. The sample consisted of 254 companies and covered the beginning of 1991 to the end of 2002. The returns were compared against the same country's respective capital weighted all share index the companies were listed in with an exclusion of the first day return. The five-year annual return for the IPO stocks of each country were as follows: 0,41 % in Finland, 1,01 % in Sweden, 6,93 % in Denmark, and 9,82 % in Norway. The average five-year annual return of all stocks ended up being 4,54 %. The Danish and Norwegian IPO stocks managed to beat their respective benchmark indices as opposed to the IPO stocks of Finland and Sweden. The five-year annual return of the whole sample against the benchmark index was -3,18 %.

## 2.2. Motives for going public

Private companies have numerous reasons of going public via IPO and the motives are usually company-specific. Therefore, it is important to consider both the positive and negative impacts from both company and shareholder perspective. The most notable reasons for a company to go public are to acquire capital for future operation expansion as well as to increase current shareholder liquidity by being able to trade stocks in a public market (Ritter & Welch, 2002). The increased liquidity leads to better capital access. The results of a study conducted by Kim & Weisbach (2008) suggest that the capital accumulated from IPOs is mainly used for investments in research and development. The

investments in research and development were significantly higher by companies that had raised the capital via IPO than by those investing capital gained from business. The study also suggests that a company might go public to benefit from prevalent market conditions. This is done by timing an IPO to a period of high market valuations. Additionally, an IPO might be conducted if the shareholders see an opportunity to sell their shares at a higher than intrinsic value.

Zingales (1995) proposes a theory that an IPO might significantly advance a possible future company acquisition as well as company value. The findings suggest that an IPO allows the initial owner to maximize the value of a future sale by managing the relation of profit distribution and company ownership. The awareness of a private company is often limited to stakeholders that already have relations to the company directly. This conspicuousness can often be expanded with an IPO which is usually followed up by media coverage as well as broader financial industry monitoring (Draho, 2004).

### 2.3. IPO Process

Katti & Phani (2016) propose a concept that separates the IPO process into multiple phases. The factors of each phase have a significant influence on the success of an IPO. Different issue-specific factors, most importantly issue size and issue procedure also play a key role in the degree of IPO underpricing.

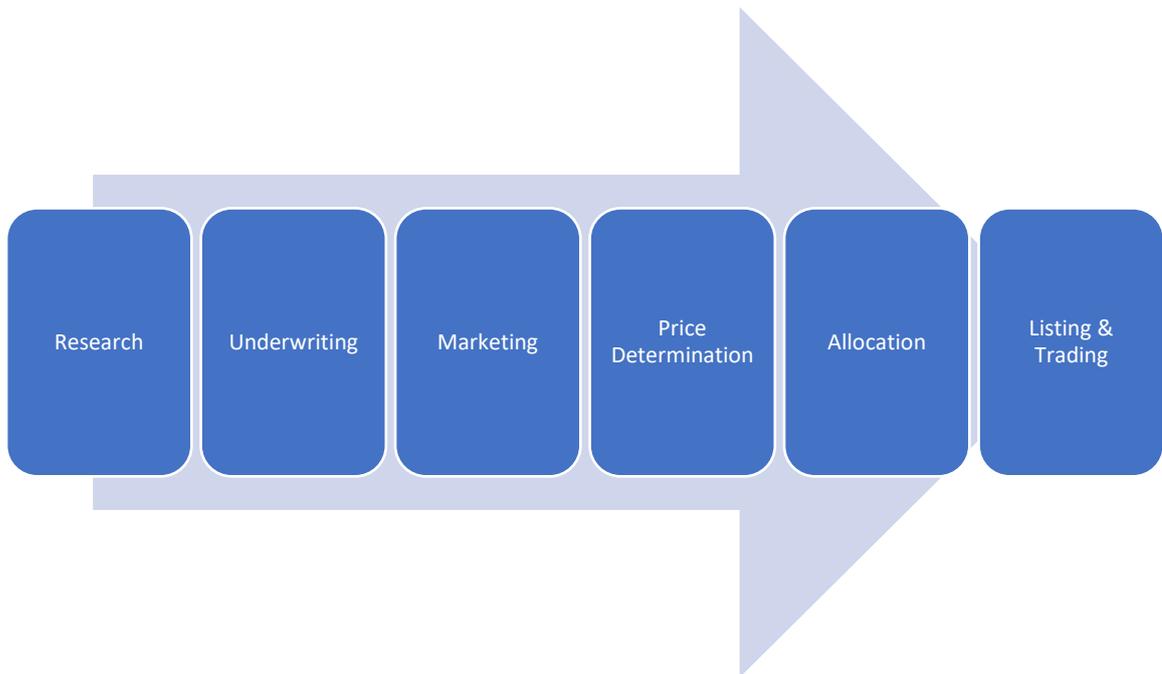


Figure 1. Phases involved in the IPO process. (Adapted from Katti & Phani, 2016)

In the first step, the issuing company assigns an underwriter, typically an investment bank to conduct the IPO process. The phase involves various research operations that are necessary for the commencement of the process. The underwriter performs due diligence on the impacts of prevalent macroeconomic figures and indicators on the success of the IPO. Due diligence is also done on industry-specific factors such as industry development and its potential, capital structure, and several financial ratios (Katti & Phani, 2016).

Katti & Phani (2016) state that the underwriting phase is carried out after the main research is done. This phase includes filing a draft prospectus with regulatory authorities alongside the issuing company's registrar. A syndicate structure of possible investment banks involved in the issue is determined in this stage. Syndicate structure refers to a temporary coalition of businesses that are formed to manage large transactions (Investopedia, 2020a). During the time this phase is underway, the issuing firm should also fulfill the requirements set by the stock exchange of the intended listing. The requirements vary from one another based on the stock exchange in question.

The listing requirements for the main lists of Nasdaq Helsinki and Nasdaq Stockholm are harmonized for the most part. The main listing requirements are as follows: moving onto IFRS financial statements, a statutory disclosure obligation, a market cap minimum of 1 million euros, and a minimum of 25 % of the free float held by the public. The shares must be owned by at least 500 qualified shareholders. Both exchanges have a minimum requirement for a company's share capital: 80 000 euros in Nasdaq Helsinki and 500 000 Swedish crowns in Nasdaq Stockholm (Pörssisäätiö, 2016; Nasdaq, 2019).

The Nasdaq First North list, on the other hand, has significantly fewer listing requirements. This allows smaller growth companies to access capital easier. The free float held by the public must be at least 10 % continuously. The number of shareholders must also be sufficient to ensure ownership distribution. Unlike the main lists, the First North does not require IFRS reporting and is in approval of local accounting standards (Nasdaq 2017).

According to Katti & Phani (2016), the third phase consists of the marketing of an issuing company. The issue is advertised to retail investors by direct marketing as well as through media coverage. The issuer might also arrange roadshows to showcase key information about the company to institutional investors. A roadshow consists of a series of sales presentations and meetings in various locations (Investopedia, 2019).

The fourth step of the process concerns the determination of the issue price. Katti & Phani (2016) state, that the price determination normally consists of book-building that is an underwriter's procedure of determining a price for the issuing company. The book-building process consists of receiving bids from institutional investors and gathering information on incoming demand, payments, and possible revised bids. The book is kept ensuring the price and quantity meet the demand and eventually determines the cutoff price (Investopedia, 2020b). The above is the method usually utilized in the pricing of an IPO. The determination of a price can also be done by either an auction or by setting a fixed price without the involvement of bids from investors. However, the above methods have been mostly driven out by the more flexible method of book building (Jagannathan & Sherman, 2006).

The fifth step of the IPO process addresses the allocation of shares to committed investors. The allocation is done based on the bids collected in the previous phase. Different methodologies for allocation are used in different countries. In some countries, the allocation is done by the discretionary power of the underwriter. A method of allocation based on the size of oversubscription is another option (Katti & Phani, 2016).

The finishing step of the IPO process covers the listing of shares on an exchange. This step of the process is generally done within a week after the allocation is complete (Katti & Phani, 2016).

#### 2.4. The efficient market hypothesis

It is essential to consider the efficient market hypothesis (EMH) in this study since underpricing is an anomaly from market efficiency. It holds the assumption that all available information concerning a security should be available for everyone and have an immediate impact on its prices (e.g., negative information has a negative impact on the security price and vice versa). In a non-efficient market instance, investors can make excess returns in relation to the risk (Knüpfer & Puttonen, 2018). Eugene Fama, a United States professor can be considered a founder of the theory. The EMH has since been further researched and expanded and has become a fundamental principle of economics.

Fama (1970) states that markets have three different grades that demonstrate efficiency: weak efficiency, semi-strong efficiency, and strong efficiency. A market of weak efficiency only reflects all the historical data concerning a company to a stock's price. The security prices follow a so-called random walk, which indicates that historical price data and information cannot be utilized to predict upcoming returns. The semi-strong form reflects all historical and current publicly available information such as annual reports, security issues, etc. to a stock's price. Therefore, excess returns are not possible by analyzing publicly available company-related data. The strong efficiency form includes information in possession of insiders alongside everything involved with the semi-strong form. The theory

suggests that an action made by management is immediately reflected in the stock price, even before it is made publicly available. Due to this, excess returns are not possible even by having access to insider information.

The EMH has also been a subject of criticism, especially after the global financial crisis. The critics have argued that the hypothesis does not apply in the real world, using the financial crisis as an example. In response, the advocates of the EMH have stated that the theory has never implied that the markets function efficiently all the time, and rather, the theory applies to most investors at most times. The theory has been contested in academic literature with varying results. Chan et al. (1997) researched the market efficiency within 18 different stock exchanges from a timespan of 1961-1992. The Helsinki stock exchange was involved in the study and according to the results, only the weak efficiency conditions were realized in all the exchanges. Munir et al. (2012) in turn investigated market efficiency in the Asian markets. The sample consisted of five different stock exchanges and the results indicate that market efficiency did not take place in three of the exchanges.

## 2.5. Underpricing

Stock underpricing is a frequent anomaly in initial public offerings and is, therefore a commonly researched subject. In the context of IPOs, the underpricing can be determined as a percentage difference in the listing price in relation to the closing price of the first market day. In most cases, the IPO price is set close in time to the stock market trading, which lowers the possibility of major market moves occurring in the delay between pricing and trading. Finland is an exception though since the cutoff price might be determined way before the first trading day (Ljungqvist, 2007).

A substantial amount of companies going public are young growth companies, whereupon their valuation is difficult to determine by discounting future cash flows. Young companies also lack data that could be utilized for future growth expectations. Therefore, it is recommended to use accounting numbers alongside different company-related multipliers to value an IPO (Kim & Ritter, 1999).

With decades of active research in different countries and stock exchanges, the academic literature has come up with multiple theories for the cause of underpricing. Theories regarding underpricing, such as asymmetric information, winner's curse, and hot issue markets are addressed in the subsequent sections. Previous literature concerning the evidence of the phenomenon is addressed in the literature review section.

### 2.5.1. Asymmetric information

Asymmetric information is defined as uneven knowledge between different parties. Some stakeholders are more informed than others, which may lead to inefficiency among investors. According to Ritter & Welch (2002) previous research on underpricing mostly show a positive correlation between underpricing and asymmetric information.

According to Ritter & Welch (2002), the theories of asymmetric information can be divided into two scenarios. Either the issuer possesses more information than the investor or vice versa. In a scenario where the issuer is more informed than the investor subscribing to the IPO, the issuer might intentionally sell its possessed shares at a price level that is below the intrinsic value. This is based on a theory, which suggests that leaving money on the table on an IPO signals higher quality; it is thought that only companies of high quality can afford to offer their issue at a lower price. The issuer can later regain its thrown-away money after the stock has been listed and risen in value. On the contrary, in a scenario where an investor possesses more information in relation to the issuer, the issuer faces the problem of not being aware of the demand for its stock. Such a scenario usually occurs, when the investor is more aware of the prevalent macroeconomic indicators such as general IPO demand (Ritter & Welch, 2002; Allen & Faulhaber, 1989).

### 2.5.2. Winner's curse

The winner's curse is a phenomenon that typically occurs in a bidding competition. The competition consists of multiple bidders, each with their offers. In a winner's curse

phenomenon, a bidder with the highest offer ends up making an offer that exceeds the intrinsic value of the subject. Therefore, the highest bidder in the competition in fact ends up being a loser. The phenomenon is closely tied to asymmetric information and market inefficiency since investors in efficient markets would not make offers above the intrinsic value (Thaler, 1988).

Rock (1986) suggested that the winner's curse is a typical occurrence in the IPO markets. The theory categorizes investors based on their understanding of the intrinsic value of an issuing company: informed investors, who only subscribe to underpriced IPOs, and uninformed investors that do not see the difference between underpriced and overpriced IPOs. The theory proposes that uninformed investors subscribe to every single IPO with an equal position since they are unaware of the intrinsic values. Therefore, uninformed investors may earn negative returns for investing in overpriced IPOs. The informed investors on the other hand make larger investments the higher the magnitude of underpricing is. Therefore, informed investors have greater access to excessive returns.

The possible discouragement caused by negative returns could end in a situation, where the uninformed investors retreat from IPOs completely. As a result, the bids of informed investors are not enough to cover and oversubscribe the whole offering. An undersubscribed IPO refers to a full allotment and chances are, an undersubscribed issue is priced lower in the market than the initial offer price. The winner's curse theory proposes that issuers tackle this problem by deliberately pricing their IPOs at a discount to encourage enough investors (Rock, 1986).

### 2.5.3. Hot issue markets

Ibbotson & Jaffe (1975) observed cyclical and predictable attributes in the IPO market. The periods can be sectioned into hot issue markets and cold issue markets, with the former tending to offer abnormally high returns. Therefore, the prices do not follow a random walk, and investors can utilize the predictability and focus their investment decisions on periods of a hot issue. The impacts of hot issue markets on a security price can be seen up to a month after the emission. The more time elapsed since the emission, the smaller the impacts of the phenomenon. According to Ritter & Welch (2002), the prevalent market performance plays a major role in a company's decision to go public. Therefore, the IPO activity has a major variation between periods of hot and cold issues. Additionally, the issuer can also utilize the predictability of hot issue markets by setting its issue price low and hence, increasing the likelihood of underpricing (Ibbotson & Jaffe, 1975).

### 3. Research methods

This chapter introduces the methodology and research material utilized in the study. The methodology includes a linear regression model to study the relationship between IPO first-day underpricing and different factors having an impact on the phenomenon. The linear regression model is conducted independently for Finnish and Swedish IPOs to consider possible country-specific factors. The longer timeframe returns of the newly issued firms are compared to market returns by conducting two different market portfolios: an equally weighted portfolio and a value-weighted portfolio. The shares listed in the Finnish and Swedish stock markets will have their corresponding portfolios and therefore, the returns of both markets can be compared to each other as well. The returns of three different key points are also measured in relation to risk using the Sharpe ratio.

The analysis used in the thesis is executed using quantitative research methods. The subject of the study includes all the companies going public in the Finnish and Swedish stock exchanges during the period of 2015-H1/2021. The study utilizes six different key points of time to measure returns: the initial offer date, the first trading day, the first week, the first month, and the third month from the first trading as well as the final day of the study period. The first trading day is mainly utilized for the calculation of short-term underpricing. The latter three are used to measure performance in comparison to risk. The end of the study period is used to measure the long-term performance of newly listed firms in relation to market performance. This is done separately for both the stock exchanges by comparing the assembled portfolios with their corresponding country-specific market indices. The portfolio returns are also compared to each other.

#### 3.1. Data

The data gathering is performed manually from different sources and databases. Firstly, each of the issuing companies is picked based on the issue type to only include IPOs in the sample. As mentioned earlier in the study, companies conducting dual listings, market

movers, spin-off companies, SPACs, and delisted companies are left out of the sample. The issue data is gathered from Nasdaq's website. The daily price data is collected from both the Refinitiv Eikon database and Yahoo Finance. All the price data collected is adjusted for splits, dividends, and capital gain distributions. The initial offer prices and dates are picked from companies' own published prospectus as well as *www.ipohub.com*. Company-specific data, such as sector and age are picked from the web page of Yahoo Finance. Investing.com is used to gather daily index price data as well as the Finland 10-year Government bond data.

The IPOs for both exchanges follow a similar trend in terms of yearly volume. A major increase in the volume can be observed for the first half of 2021 in comparison to the equivalent in 2020, as seen in Figure 2. The IPO companies are classified into 11 different sectors (Figure 3). Majority of the companies gone public during the sample timeframe belong either to the industrials, technology, or utilities sectors.

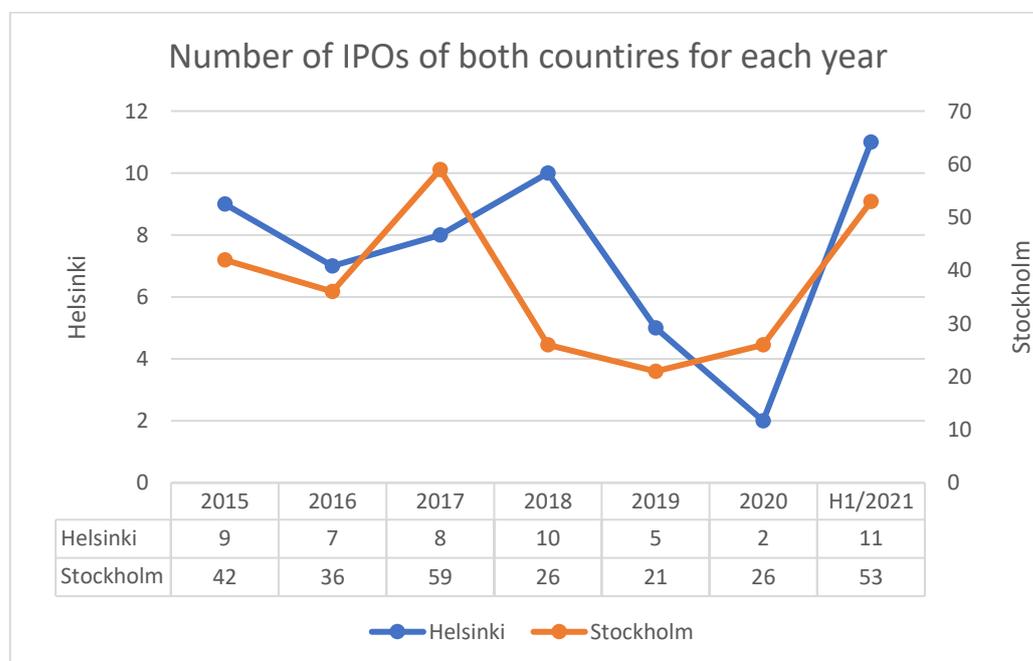


Figure 2. Number of IPOs in the sample for each year

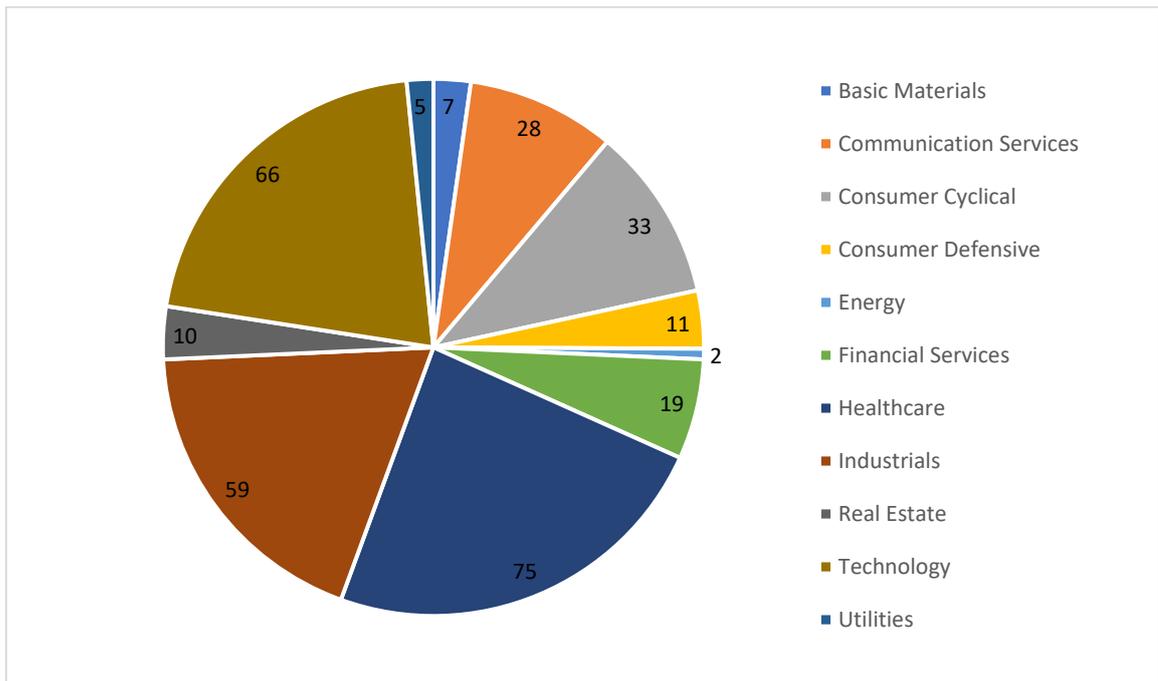


Figure 3. The number of IPOs by sector

### 3.2. Regression model

The relationship between a dependant variable – IPO underpricing - and different explanatory variables is examined through a linear regression model. The model is implemented from the sample of the study to determine how the value of the response variable changes in response to changes in explanatory variables. The regression model is conducted independently for Finnish and Swedish IPOs to consider possible country-specific factors.

#### 3.2.1. Dependant variable

The regression analysis uses IPO underpricing as a dependant variable since the aim of the study is to examine the relationship between the level of underpricing and different factors influencing it. Underpricing refers to an IPO that yields a positive return on the first trading day. On the contrary, if the return is negative, the IPO can be considered overpriced. The

phenomenon can be measured as a percentage difference between the offer price and the first day closing price. The formula based on Ritter (1991) is used to calculate the initial return (IR) for each company included in the sample and is as follows:

$$IR = \frac{\text{First day closing price} - \text{Offer price}}{\text{Offer price}} \quad (1)$$

### 3.2.2. Independent variables and hypotheses

To examine the relationship between the initial returns and different factors influencing underpricing, six different independent variables are used. The variables alongside with a brief description of each will be listed below. Different ways of approaching them is going to be introduced and adapted from previous literature. The hypothesis for each variable is also listed and is going to be empirically tested with a linear regression model.

**Market return.** The market return on the day of IPO is treated as a continuous variable. The return is calculated by the percentage difference in the opening price and the closing price one by one. The returns are calculated for each day, a company included in the sample has conducted an IPO. The indices used for this purpose vary based on the market a company goes public on. The companies listed on Nasdaq Helsinki and Nasdaq Stockholm are compared to OMX Helsinki Benchmark Gross index and OMX Stockholm Benchmark Gross index, respectively.

Various studies (Ibbotson & Jaffe, 1975; Ritter & Welch, 2002) suggest that periods of high market yields increase the magnitude of underpricing. Additionally, (Derrien & Womack, 2003) found that daily market returns have a notable influence on the degree of underpricing. Therefore, an assumption can be made that the respective market return has a positive impact on the magnitude of underpricing

Hypothesis 1:

*There is a positive relationship between the market return and the magnitude of underpricing on the day of IPO.*

**Company age.** The operating age of a company is treated as a continuous variable. Previous literature has found positive A natural logarithm is going to be used of the number of years that fit between the calendar year of IPO and the calendar year of company establishment. The longer a company has operated, the less likely it is for age-affiliated asymmetric information to exist. Since some of the companies in the sample have gone public the very same year they are founded, a value of one is added to the age of each company. This is crucial since the natural logarithm of zero is not defined. The method is applied from studies conducted by (Ritter 1991; Clarkson 1994) who found the company age to negatively impact the degree of underpricing.

$$\text{Company age} = \ln (1 + (\text{Year}_{IPO} - \text{Year}_{founding})) \quad (2)$$

Hypothesis 2:

*There is a negative relationship between the age of an issuing firm and the magnitude of underpricing.*

**IPO Timing.** The variable considers the point of time in a year the company goes public. It is treated as a dummy variable, taking values of zero when the first trading day is during the months from May to October, and values of one when the first trading day is during the months from November and April. The variable is based on a study conducted by Boumen & Jacobsen (2002) in which higher stock market returns are yielded between the November-April months than between the May-October months. The variable is also consistent with previous research that suggests that periods of high market yields tend to yield higher returns from IPOs.

Hypothesis 3:

*The degree of underpricing is higher during the November-April months.*

**Sector.** The company's operating sector variable is also treated as a dummy variable. It takes a value of one if the company operates in a risky sector – technology and a value of zero otherwise. The dummy is based on a similar variable used in studies by Loughran & Ritter (2004) and Daily et al. (2005). The dummy is consistent with previous literature that suggests that the high-technology sector holds a greater risk and ex ante uncertainty and is, therefore, an influence of higher underpricing.

*Hypothesis 4:*

*The degree of underpricing is higher in the Technology sector.*

**Market.** The market variable takes the value of one if the company is listed on a First North market list and zero if listed on the main list. This variable somewhat gives a sense of the impact of a company's size on underpricing, since the regulations of First North are primarily adjusted for smaller companies seeking growth. The hypothesis is based on a study conducted by (Beatty & Ritter, 1986) which suggests that ex ante uncertainty of a company increases its degree of underpricing in an IPO.

*Hypothesis 5:*

*The degree of underpricing is higher in the First North growth lists.*

**Over/Underpriced.** The variable is treated as a dummy and takes values of one and zero, if the company going public has a positive or negative return on the first day, respectively. The variable is used to control over and underpriced IPOs and is not the main subject of the research. Therefore, no hypothesis is going to be formed to the variable. The idea is to move variables from the residuals to the determining function in order to increase the explanatory power of the model.

### 3.2.3. Multiple linear regression

In order to determine the relationship between IPO underpricing and different factors influencing it, a multiple linear regression model is going to be carried out. The model is conducted separately for the Finnish and Swedish IPOs. This model uses two or more independent variables to determine how the changes occurring on the independent variables influence the changes on the dependent variable. Multiple linear regression allows specifying which of the independent variables has more of an impact on the response of the response variable. The model also assists in explaining the direction of the influence. The formula for the multiple regression model is as follows and is used for the Finnish and Swedish IPO datasets:

$$IR = \beta_0 + \beta_1 \text{marketreturn} + \beta_2 \ln(\text{age}) + \beta_3 \text{timing} + \beta_4 \text{sector} + \beta_5 \text{market} + \beta_6 \text{overunder} + \varepsilon \quad (3)$$

The ordinary least squared (OLS) principle is going to be utilized in the study. The method is frequently used in a regression analysis. OLS minimizes the squared distance of each observation point. To prevent large positive distances from being nullified by the large negative distances, each of the distances is squared. The distances from each observation point to the regression line are called least squares residuals (Hill et al. 2012, 51).

To complete the model, assumptions on the equation components need to be made. Hill et al. (2012) have listed six assumptions for the multiple regression model.

1. The expected value of the dependent variable changes for each change in the independent variables. All the data used should fit the regression model formula.
2. The expected value of the error term is conditionally zero in all the observations.
3. The variance of the dependant variable's probability distribution is constant.

4. None of the two observations on the dependant variable are correlated. There may not be autocorrelation between residuals.
5. There is no high correlation between any of the independent variables. The variables should take a minimum of two values.
6. The residuals are normally distributed.

### 3.3. Performance against indices

The performance of the IPO stocks against indices is tested by conducting two portfolios and comparing their returns to the returns of benchmark indices. The first portfolio holds equal weight on all the stocks. The idea in the equal weight portfolio is, that one unit of a currency is invested in each stock. The value-weight portfolio, on the other hand, is weighted based on the price of a single stock. The higher the value of an individual stock, the higher the weight in the portfolio and vice versa. All the stock price quotations of the time frame are adjusted for splits, dividends, and capital gain distributions.

The stocks are added to the portfolio based on the closing price of the first trading day. They are added one by one along the 2015-H1/2021 timeframe. The buy-and-hold procedure is utilized, which indicates all the stocks added to the portfolio will be held until the ending date. The performance of the Finnish stocks is compared to the OMX Helsinki Benchmark Cap Gross index (OMXHBCAPGI) and Swedish stocks to the OMX Stockholm Benchmark Cap Gross Index (OMXSBCAPGI). Comparing the stocks to gross indexes is important since the gross index takes dividends into account by “investing them back”. The cap index better indicates the return of the market in its entirety since the maximum weight of a single stock is capped at 10 %.

The study uses two different methods of acquiring the index units. They are meant to illustrate the possibilities of an investor buying shares of an index fund. They also help to balance out the disadvantage of the portfolios caused by the relatively large weight of cash for most of the holding period. The methods are as follows:

1. An index value which corresponds to the portfolio value and is bought at the start of the timeframe and held through until the end of the period.
2. An index position of the corresponding size to the IPO stock is added symmetrically on the same date as the IPO stocks are added to portfolios.

The market-adjusted portfolio returns are calculated for each portfolio and both index positioning manners. The market-adjusted portfolio returns for the method of buying the whole index position at 2.1.2015 are calculated with the following formula:

$$MAR_{p1} = \sum_{i=1}^n (w_s * r_s) - r_m \quad (4)$$

$n$  = the amount of stocks in portfolio

$w_s$  = weight of a stock

$r_s$  = return of a stock

$r_m$  = index return for the whole period

Subsequently, the formula for market-adjusted portfolio returns using symmetric index positioning is as follows:

$$MAR_{p2} = \sum_{i=1}^n (w_s * r_s) - \sum_{i=1}^n (w_s * r_m) \quad (5)$$

$n$  = the amount of stocks in portfolio

$w_s$  = weight of a stock

$r_s$  = return of a stock

$r_m$  = return of an index position

### 3.4. Sharpe ratio

Sharpe ratio, initially presented by Sharpe (1966) can be used as a tool to measure an investment's return in comparison with a risk-free asset. It compares the possible excess return of an asset to its volatility during a particular time frame. Therefore, it illustrates the compensation that is gained for taking the risk associated to the asset. The higher the ratio, the better the asset performs in relation to risk. Sharpe ratio is calculated by subtracting the return of a risk-free interest rate from the asset's return in question. It is then divided by the standard deviation. In this thesis, holding periods of 1 week, 1 month and 3 months are used for the calculation of the ratio. The periods are defined as follows: 1 week refers to 7 days, 1 month to 30 days and, 3 months to 90 days. The price data used consists of daily closing prices that are adjusted for possible stock splits, dividends, and capital gain distributions. The 10-year Finland government bond is used as the risk-free asset in the study. The formula for the Sharpe ratio is as follows:

$$S = \frac{R_i}{\sigma_p} = \frac{R_p - R_f}{\sigma_p} \quad (6)$$

$R_i$  = return exceeding the risk-free rate

$R_p$  = return of the IPO stock

$R_f$  = risk-free interest rate

$\sigma_p$  = standard deviation of the IPO stock

## 4. Results

This chapter presents the thesis's empirical findings and discusses them. An answer to all the three research questions is aimed to be found. The first part covers the findings of the linear regression model conducted to examine the impacts of different company and IPO characteristics on the degree of underpricing. The second part presents the performance of the portfolios consisting of IPO stocks against indices. Subsequently, the relatively short-term Sharpe ratios are presented in the third part.

### 4.1. Regression

The study conducted two linear regression models to examine the relationship between IPO underpricing and different factors influencing it and to answer the first question of the thesis. The regression models were conducted separately for both countries subject to the research. The initial return of each company is used as a dependent variable in the models. To explain the changes in initial return, six different company and IPO-related factors are chosen and treated as independent variables. The regression considers all the IPOs in the sample from the period of 2015-H1/2021, however, the IPOs are divided into two models based on the country. An ordinary least squares method is utilized in the regression models. The models have a confidence interval of 95 %. The regression holds different assumptions that require statistical testing. All the test results are listed in appendices 1-5. Assumptions are made, that the model is homoscedastic, and multicollinearity does not exist. It is also assumed that the residuals are normally distributed.

Table 1. Results of the multiple regression analysis for the Finnish IPOs

Initial Return	Hypothesis	Coefficient	Standard Error	t-value	PR >  t
MarketReturn	Positive	2,45	2,87	0,85	0,40
CompanyAge	Negative	-0,01	0,25	-0,36	0,72
IPOTiming	Positive	0,01	0,42	0,21	0,84
Sector	Positive	0,04	0,15	0,14	0,97
Market	Positive	0,08	0,47	1,77	0,01
Over/Under	(Control)	0,17	0,04	4,01	0,00
Constant	N/A	-0,07	0,09	-0,81	0,42
		<b>R-squared</b>	<b>Adjusted R-squared</b>	<b>F-value</b>	<b>Prob &gt; F</b>
		0,31	0,22	3,2	0,01

Table 2. Results of the multiple regression analysis for the Swedish IPOs

Initial Return	Hypothesis	Coefficient	Standard Error	t-value	PR >  t
MarketReturn	Positive	0,57	1,62	0,35	0,72
CompanyAge	Negative	0,01	0,02	0,53	0,60
IPOTiming	Positive	0,02	0,27	0,84	0,40
Sector	Positive	0,05	0,34	0,13	0,89
Market	Positive	-0,04	0,36	-1,14	0,26
Over/Under	(Control)	0,36	0,28	12,77	0,00
Constant	N/A	-0,16	0,06	-2,53	0,01
		<b>R-squared</b>	<b>Adjusted R-squared</b>	<b>F-value</b>	<b>Prob &gt; F</b>
		0,43	0,418	29,96	0,00

The regression results indicate that 31% (Table 1) of the initial returns for the Finnish IPOs can be explained by the factors in the models. The corresponding value for the Swedish IPOs is 43% which is moderately higher (Table 2). It should be noted that most of the coefficient values remain relatively low. According to Tables 1 & 2, the highest impact on the initial return is caused by the corresponding market return on the first trading day. This impact is significantly higher within the Finnish IPOs. Additionally, only the p-value of the control variable, indicating whether the IPO was over or underpriced, is less than 0,05. None of the remaining independent variables exhibit a p-value of 0,05, indicating to the nonexistence of statistical significance. The p-ratio of the sector variable for the Finnish IPOs exhibits a value of 0,97 and the corresponding value for the Swedish IPOs a value of 0,89, (Tables 1 & 2) indicating that the difference is caused by randomness with a high likelihood.

All the relationships studied for the Finnish IPOs seem to be consistent with the hypotheses made (Table 1). The most significant impact can be seen with the market return variable. This is consistent with previous research (Derrien & Womack, 2003) that has shown a positive relationship between daily market return and initial returns. Out of all the variables, the market and company age variables within the model considering Swedish IPOs ended up being the only ones contradictory to the hypotheses. However, no previous literature has covered underpricing differences for companies listing on the Nasdaq main list and the First North. Subsequently, the hypothesis is solely based on the assumption that mainly the smaller growth companies, which are more subject to ex ante uncertainty, list on the First North. Even though the findings are consistent with the hypothesis, the impacts are not as significant as assumed. However, a conclusion can be made that the underpricing is higher in the November-April months and the findings regarding IPO underpricing seem to be consistent with the “Sell in May and go away” effect issued by Boumen & Jacobsen (2002). Companies operating in a technology sector seem to also have a higher degree of underpricing, similar to the findings of Loughran & Ritter (2004) and Daily et al. (2005). Low coefficients leave a conclusion that underpricing is to a notable degree influenced by other factors not considered in this study.

The hypotheses were based on the findings of previous literature on the subject. The fact, that the results of this study find less significant results in comparison with previous findings might be caused by country-specific factors. For instance, older and more distinguished companies could be a subject of more hype specifically in Sweden, hence the positive relationship between the age variable and initial return in the Swedish IPO model. However, it should be noted that the fact that most of the parameters had a relatively small impact on the magnitude of underpricing is rational. The significance of the EMH would be close to nonexistent if general company characteristics such as sector and age would largely determine how a company is valued. However, during certain market periods, the impacts could be a lot higher. Occasionally, some market sectors tend to be favored more than others, for instance, the technology sector in the early 2000s.

According to the correlation matrix, none of the independent variables show a correlation above the value of 0,80 (Appendix 1). The highest correlation (0,39) can be seen between the company age and market variables of the Swedish IPO companies (Appendix 1). This indicates that younger companies list on the First North lists somewhat more often. However, since the correlation is not above 0,8 (or below -0,8), multicollinearity does not pose a problem in the model as was assumed. Heteroskedasticity is not present in the data either, as was assumed. This is tested with the Breusch-Pagan test for heteroscedasticity, which exhibits a p-value greater than 0,05 (Appendix 2). The normality of the residuals is formally tested with a Shapiro-Wilk test (Appendix 3) and illustrated by conducting a histogram and a Q-Q plot of the residuals (Appendix 4 & 5). The test result indicates that the residuals are not normally distributed in either dataset since the Shapiro-Wilk test exhibits a p-value equal to zero. According to the histogram and Q-Q plot of residuals, possible outliers and extreme values may be worsening the problem (Appendix 4 & 5). This is contrary to one of the assumptions of the OLS model and can be described as an OLS violation.

In order to tackle the problem, either a natural logarithm or a square root transformation can be conducted to the variables. On top of this, possible outliers can be pursued to be eliminated. However, these measures do not significantly change the outcome since even after the implementation, the tests indicate non-normality of residuals. The non-normality problem may imply that the coefficients created in the regression analysis might be somewhat inaccurate. It should be noted though, that the sample size used in the analysis is relatively large, consisting of over 300 observations. According to Wooldridge (2012) some econometricians believe that a sample size of 30 is sufficient to leave the violation relaxed. Additionally, as concluded by Knief & Forstmeier (2021), linear regression models conducting statistical hypothesis testing and violating the normality assumption by an error structure in the Gaussian, are most often robust to the violation.

## 4.2. Performance against indices

Four different portfolios consisting of IPO stocks were conducted to measure long-term performance and to answer the second question of the study. Surprisingly, all the portfolios outperformed the corresponding index returns even in a scenario, where the full index position is bought at the start and held through the entire timespan. This is contrary to what academic literature suggests about long-term performance. On average, IPO stocks start to underperform the market a year after the offering. However, the returns do not measure an average buy-and-hold return of IPO stocks, since each stock is bought at a different time and held for a varying duration of time. This means that the stocks bought at the beginning of the period have more time for price development, compared to ones bought close to the ending date. The stocks bought within the last year of the study period are also more likely to outperform the benchmark, since previous literature suggests, that IPO stocks generally outperform the markets up to a year from the point of going public.

The equal-weight portfolio returns have a major difference between Finland and Sweden. The portfolio consisting of Finnish stock has some major outliers that were. Out of the 52 stocks in the portfolio, the four stocks with the highest return accounted for more than 60% (or 100,5 % percentage points) of the overall portfolio growth. If these were left out, the portfolio would have been outperformed by the full position index measure by far. The Swedish portfolio, on the other hand, does not have as many outliers in relation to the size of the portfolio. It should be noted though that since the portfolio holds so many separate stocks, the weight of a single stock is low. Hence, stocks with extraordinary high returns do not contribute to the portfolio return as much as in the Finnish portfolio.

Table 3. Buy-and-hold returns during 2015-H1/2021, equal weight portfolio

	<b>Finland</b>	<b>OMXHBCAPGI</b>		<b>Sweden</b>	<b>OMXSBCAPGI</b>	
		Symmetric position	Full position at 2.1.2015		Symmetric positioning	Full position at 2.1.2015
<b>Return</b>	163,77 %	53,78 %	127,98 %	120,97 %	60,06 %	119,05 %

Symmetric position refers to an index position of the corresponding size to the IPO stock which is added symmetrically on the same date as the IPO stocks are added to portfolios.

Full position at 2.1.2015 refers to an index value that corresponds to the portfolio value and is bought at the start of the timeframe and held through until the end of the period.

The significance of the best-performing stocks in the Finnish portfolios is lower in the value-weighted portfolio. Most of the stocks that had the best performance were priced at the lower end of the range at the beginning. In the Swedish portfolio, the highest contributors to the value-weighted portfolio return are the stocks that were both priced higher at the beginning and made significant returns. In addition, most of the best-performing stocks in the portfolio had a relatively high value on the first day of trading. Therefore, the value-weight portfolio performed better than the equal-weighted one.

The range of IPO pricing in Finland is much smaller than the equivalent in Sweden. The standard deviation of the first-day closing prices is more than 15 times higher in Sweden. This indicates that the distribution of the value weights is also much higher, making a significant difference in the returns of the two Swedish portfolios. Even though the difference in returns of the two portfolios consisting of Finnish stocks is relatively even higher, the difference is mostly caused by the highest return stocks having a lesser impact on the value-weighted portfolio.

Table 4. Buy-and-hold returns during 2015-H1/2021, value-weighted portfolio

	<b>Finland</b>	<b>OMXHBCAPGI</b>		<b>Sweden</b>	<b>OMXSBCAPGI</b>	
		Symmetric position	Full position at 2.1.2015		Symmetric positioning	Full position at 2.1.2015
<b>Return</b>	140,58 %	53,66 %	127,98 %	134,36 %	59,59 %	119,05 %

Symmetric position refers to an index position of the corresponding size to the IPO stock which is added symmetrically on the same date as the IPO stocks are added to portfolios.

Full position at 2.1.2015 refers to an index value that corresponds to the portfolio value and is bought at the start of the timeframe and held through until the end of the period.

The market-adjusted portfolio returns are all positive which indicates that all the portfolios beat their benchmark indices by both index positioning measures. The best performing portfolio was the equal weight Finnish stock portfolio. It outperformed the benchmark index by a whopping 109,99 percentage points if measured by symmetric position and the full position by 35,79 percentage points (Table 5). The market-adjusted returns for the Finnish equal weight portfolio are significantly higher than any of the comparisons.

Table 5. Market-adjusted portfolio returns by both measures of index positioning

Mkt. Adj.	FIN Equal	FIN Value	SWE Equal	SWE Value
<b>Symmetric position</b>	109,99 %	86,92 %	60,92 %	74,77 %
<b>Full position 2.1.2015</b>	35,79 %	12,60 %	1,93 %	15,31 %

Symmetric position refers to an index position of the corresponding size to the IPO stock which is added symmetrically on the same date as the IPO stocks are added to portfolios.

Full position at 2.1.2015 refers to an index value that corresponds to the portfolio value and is bought at the start of the timeframe and held through until the end of the period.

#### 4.3. Sharpe ratio

The Sharpe ratio is used to measure performance in relation to risk. In this study, it is utilized on IPO stock to examine their short-term performance in relation to risk. This is also done to find an answer to the third research question.

The first week's mean value for the combination of Finland and Sweden is -0,19 (Table 6). The value is negative, which indicates weak performance in the first week since going public. However, the first-day closing price is included and its impact is relatively high in a week's time span. The country-specific difference is significant. In the first week, Finnish IPOs have a Sharpe ratio of 0,45 (Table 6) referring to a better performance than the risk-free return in relation to risk. The median values are all positive. This indicates that there are more companies with a positive Sharpe ratio than ones with negative in both markets. It also indicates that there is a relatively high number of companies with a quite notable

negative Sharpe in Sweden. In conclusion, singular stocks with abnormally high or low Sharpe skew the result by some degree.

Table 6. Sharpe ratios of weekly returns

	<b>Both</b>	<b>Finland</b>	<b>Sweden</b>
<b>Quantity</b>	315	52	263
<b>Mean</b>	-0,19	0,45	-0,36
<b>Median</b>	0,20	0,43	0,09
<b>Standard deviation</b>	8,74	1,55	9,52
<b>Max</b>	11,24	7,19	11,24
<b>Min</b>	-2,75	-1,59	-2,75

The Sharpe ratios of the first month on average, see an increase in Sweden but a slight decrease in Finland (Table 7). Mean for both the countries is still not even close to being considered good by the generally approved standards. The standard deviation has significantly decreased from the first week's results. This happens as the price starts to stabilize and volatility decreases as the time frame increases. Additionally, the significance of the first trading day's price change decreases as time goes on.

Table 7. Sharpe ratios of monthly returns

	<b>Both</b>	<b>Finland</b>	<b>Sweden</b>
<b>Quantity</b>	315	52	263
<b>Mean</b>	0,08	0,34	0,04
<b>Median</b>	0,06	0,16	0,04
<b>Standard deviation</b>	0,88	0,89	0,90
<b>Max</b>	3,95	2,80	3,95
<b>Min</b>	-2,59	-1,66	-2,59

Similar observations can be seen between the Sharpe ratios of the first month and the first three months as between the first week and first month ratios. The risk-adjusted returns in relation to risk have decreased (Table 8). So has standard deviation, which indicates that several companies with abnormally high or low Sharpe ratios have gotten lower. All the maximum values have decreased, and minimum values increased, with the biggest relative change seen in the minimum value of Finland. This in combination with the risen median indicates that the lower half of the sample has started to perform better in relation to risk.

Table 8. Sharpe ratios of three-month returns

	<b>Both</b>	<b>Finland</b>	<b>Sweden</b>
<b>Quantity</b>	315	52	263
<b>Mean</b>	0,06	0,25	0,03
<b>Median</b>	0,16	0,26	0,14
<b>Standard deviation</b>	0,71	0,67	0,73
<b>Max</b>	3,30	2,66	3,30
<b>Min</b>	-2,37	-0,72	-2,37

## 5. Conclusions

This study aimed to find out how different company and listing characteristics impact the magnitude of IPO underpricing. For this purpose, a linear regression analysis was performed between the initial return of the first day and market return, company age, sector, market of listing as well as the time of the year of listing. The study also aimed to examine the longer-term performance of the listed companies. This was done by conducting portfolios and comparing their performance to the returns of the markets. Lastly, the study aimed to measure the short-term performance of IPO stocks in relation to risk, for which the Sharpe ratio was utilized.

The first research question was: *How do the different company and listing characteristics influence the magnitude of IPO underpricing in the stock exchanges of Finland and Sweden?* According to the findings of the study, the characteristics explained the magnitude of IPO underpricing moderately well. However, none of the results showed statistical significance, which indicates the relationships were caused by coincidence to a certain extent.

Most of the results found in the regression models were consistent with previous literature. The market return variable had the most significant impact. Subsequently, this impact was significantly higher in the model considering Finnish IPOs: the underpricing of Finnish IPOs is substantially higher on days of high market returns in comparison to Swedish ones. Various studies (Ibbotson & Jaffe, 1975; Ritter & Welch, 2002) suggest that periods of high market yields increase the magnitude of underpricing. Additionally, Derrien & Womack (2003) found similar results on the impact of daily market return on the degree of IPO underpricing. The coefficients of the remaining variables were, however, not as significant. It should be noted though, that the impacts of the characteristics are not constant and most likely have a lot of fluctuation between different countries and periods. For instance, all the literature cited regarding the technology dummy were considering the years 1999-2002 of the technology bubble. Therefore, the assumption made about the riskiness of the

technology sector might not be as qualified during the time frame considered in this study, hence the lower coefficient than expected. Additionally, the violation of the assumption of residual normality might impact the validity of the results to a certain degree.

The second research question was: *How have the newly listed companies in the Finnish and Swedish stock exchanges performed in comparison to their respective market indices during 2015-H1/2021?* The findings indicate that all the portfolios conducted outperformed the markets on both methods of acquiring index units. Singular stocks, that had outstanding performance contributed to most of the portfolio growth. This scenario happened in both Finnish and Swedish portfolios, but the impacts of individual stocks were higher in the Finnish portfolio since the number of stocks was lower. Both the Finnish equal and value-weighted portfolios also performed better than the respective Swedish ones, indicating that Finnish IPOs would have been a better investee in the long term than Swedish ones. Previous literature suggests that the newly listed companies, on average start to underperform the market a year after the offering. However, the returns do not measure an average buy-and-hold return of IPO stocks, since each stock is bought at a different time and held for a varying duration of time.

The portfolio returns could have been even higher if the stocks were acquired from the IPOs themselves. However, this method is only viable for larger positions since the offerings generally have a minimum order quantity. Additionally, instead of comparing the returns of the portfolios with indices, they could have been compared against a portfolio consisting of corresponding stocks that have already been subject to public trade in a stock exchange. However, since especially the Finnish stock markets are relatively small, it would have been difficult to find sufficient comparisons for every single company.

The third and last research question was: *How have the newly listed companies in the Finnish and Swedish stock exchanges performed in relation to risk a week, a month, and three months post-IPO during 2015-H1/2021?* On average, by the generally approved standards, the Sharpe ratios were sub-optimal. The results suggest that an investor holding

the stocks would be bearing excessive risk in relation to the returns. However, Finnish IPO stocks performed better in relation to risk than Swedish ones.

The risk-free rate used in the calculations of Sharpe ratios is an average of all the daily quotations of the 10-year Finland government bond during the study's timeframe. Therefore, Sharpe ratios of stocks traded in periods of higher bond yields appear higher than they would have been if actual daily or weekly quotations were used. This applies contrariwise as well. However, if daily bond yield data were used for every individual stock, most of the stocks listed between 2019 and 2021 would have been compared to a negative return.

For future research purposes, more explanatory variables could be used to maximize the model's explanatory power. On top of this, different explanatory variables for the explanation of differences in underpricing could be used. Regarding the sector variable, a dummy could be formed taking values based on, for instance, the cyclicity of a sector. The market variable could be changed to a variable that takes values based on the market value of a company. Regarding the portfolio returns, all the individual stocks could be compared against their corresponding stocks of non-issuing firms, as mentioned earlier. Additionally, the portfolios could be conducted by attempting to exclude the IPO stocks of bad quality. The Sharpe ratios could be conducted for a much longer period. They could even be adjusted to complement the returns of the portfolios that were found in this study.

## References

Allen, F. & Faulhaber, G. R. (1989). Signaling by Underpricing in the IPO Market, *Journal of Financial Economics*, 23, 303-323.

Beatty, R. & Ritter, J. (1986). Investment Banking, Reputation, and the Underpricing of Initial Public Offerings. *Journal of Financial Economics*, 15(1-2), 213-232.

Bommel van, J. (2002). Messages from Market to Management: The Case of IPOs. *Journal of Corporate Finance*, 8(2), 123-138.

Boumen, S. & Jacobsen, B. (2002). The Halloween Indicator, 'Sell in May and Go Away': Another Puzzle. *American Economic Review*, 92(5), 1618-1635.

Chambers, D & Dimson, E. (2009). IPO Underpricing over the Very Long Run. *The Journal of Finance*, 64, 1407-1443.

Chan, K. C. Gup, B. E., & Pan, M. (1997). International Stock Market Efficiency and Integration: A Study of Eighteen Nations. *Journal Of Business Finance & Accounting*, 24(6), 803–813.

Clarkson, M. (1994). The Underpricing of Initial Public Offerings, Ex Ante Uncertainty, And Proxy Selections. *Accounting and finance (Parkville)*, 34(2), 67–78.

Daily C. M., Certo, S. T. & Dalton, D. R. (2005). Investment Bankers and IPO Pricing: Does Prospectus Information Matter? *Journal of Business Venturing*, 20, 93-111.

Derrien, F. & Womack, K. L. (2003). Auctions vs. Book-building and the Control of Underpricing in Hot IPO Markets. *The Review of financial studies*, 16.

Draho, J. (2004). *The IPO Decision: Why and how Companies Go Public*. Cheltenham, Edward Elgan Publishing Limited.

Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *Journal of Finance*. 25(2). 383-417.

Hill, R. C., Griffiths, W. E. & Lim, G. C. (2012). *Principles of Econometrics*. 4<sup>th</sup> edition. Hoboken, NJ, John Wiley & Sons.

Ibbotson, R. G. & Jaffe, J. F. (1975). "Hot issue" Markets. *Journal of Finance*, 30(4), 1027-1042.

Investopedia. (2019). Roadshow. [online]. [Referenced 1.11.2021]. Available: <https://www.investopedia.com/terms/r/roadshow.asp>

Investopedia. (2020a). Syndicate. [online]. [Referenced 11.1.2022]. Available: <https://www.investopedia.com/terms/s/syndicate.asp>

Investopedia. (2020b). Book Building. [online]. [Referenced 1.11.2021]. Available: <https://www.investopedia.com/terms/b/bookbuilding.asp>

Jagannathan, R. & Sherman, A.E. (2006). Why Do IPO Auctions Fail? NBER Working Paper Series. 12151

Kim, M. & Ritter, J. R. (1999). Valuing IPOs. *Journal of Financial Economics*, 53, 409-437.

Kim, W. & Weisbach, M. S. (2008). Motivations for public equity offers: An international Perspective. *Journal of financial economics*, 87, 281-307.

Katti, S. & Phani, B.V. (2016). Underpricing of Initial Public Offerings: A Literature Review. *Universal Journal of Accounting and Finance*, 4(2), 35-52.

Knief, U., Forstmeier, W. (2021). Violating the normality assumption may be the lesser of two evils. *Behavioral Research methods*, 53, 2576–2590.

Knüpfer, S. & Puttonen, V. (2018). *Moderni Rahoitus*. 10th edition. Helsinki, Alma Talent.

Ljungqvist, A. P. (1997). Pricing initial public offerings: Further evidence from Germany. *European economic review*, 41, 1309-1320.

Ljungqvist, A. (2007). IPO Underpricing. *Handbook of Corporate Finance*. Elsevier, 375-422.

Loughran, T & Ritter, J. R. (1995). The New Issues Puzzle. *The Journal of Finance*, 50, 23-51.

Loughran, T. & Ritter, J. R. (2004). Why Has IPO Underpricing Changed Over Time? *Financial Management*, 33(3), 5-37.

Loughran, T., Ritter, J. R. & Rydqvist, K. (2021). Initial Public Offerings: International Insights. *Pacific-Basin Finance Journal*, 2, 165-199.

Munir, Q., Ching, K. S., Furouka, F. & Mansur, K. (2012). The Efficient Market Hypothesis Revisited: Evidence from the Five Small Open Asean Stock Markets. *The Singapore Economic Review*, 57(3), 1250021-1 – 1250021-12.

Nasdaq. (2017). Going Public – listing guide to Nasdaq First North. [online]. [Referenced 12.1.2022]. Available:

[https://listingcenter.nasdaq.com/assets/Listing\\_Guide\\_to\\_Nasdaq\\_First\\_North.pdf](https://listingcenter.nasdaq.com/assets/Listing_Guide_to_Nasdaq_First_North.pdf)

Nasdaq. (2019). Rule Book for Issuers. [online]. [Referenced 12.1.2022]. Available: <https://www.nasdaq.com/docs/Nasdaq%20Stockholm's%20Rule%20book%20for%20Issuers%20-%201%20January%202019.pdf>

Pörssisäätiö. (2016). Pörssilistautujan käsikirja. [online]. [Referenced 10.10.2021]. Available: [https://www.porssisaatio.fi/wp-content/uploads/2016/05/porssilistautujan\\_kasikirja\\_2016\\_final\\_web.pdf](https://www.porssisaatio.fi/wp-content/uploads/2016/05/porssilistautujan_kasikirja_2016_final_web.pdf)

Pörssisäätiö. (2021). Listautumiset Pohjoismaissa viime vuosina. [online]. [Referenced 13.10.2021]. Available: <https://www.porssisaatio.fi/blog/statistics/listautumiset-pohjoismaissa-viimevuosina/>

Reilly, F. K. & Hatfield, K. (1969). Investor Experience with New Stock Issues. *Financial Analysts Journal*, 25(5), 73-80.

Ritter, J. R. (1984). The "Hot Issue" Market of 1980. *Journal of Business*. 57(2), 215-240.

Ritter, J. R. (1991). The Long-run Performance of Initial Public Offerings. *Journal of Finance*, 46(1), 3-27.

Ritter, J. & Welch, I. (2002). A review of IPO activity, pricing, and allocations. *The Journal of Finance*, 57(4), 1795-1828.

Rock, K. (1986). Why New Issues Are Underpriced. *Journal of Financial Economics*, 15, 187-212.

Sharpe, W. F. (1966). Mutual fund performance. *The Journal of Finance*, 39, 119-138.

Thaler, R. H. (1988). Anomalies: The winner's curse. *Journal of Economic Perspectives*, 2(1), 191-202.

Westerholm, J. P. (2006). Industry Clustering in Nordic Initial Public Offering Markets. *International review of finance*, 6, 25-41.

Wooldridge, J. M. (2012). *Introductory Econometrics: A Modern Approach*, 5th edition. Cincinnati: South-Western Educational Publishing

Zingales, L. (1995). Insider ownership and the Decision to Go Public. *Review of Economic Studies*, 62(3), 425-448.

## Appendices

### Appendix 1. Correlation matrix of explanatory variables

<b>Finnish IPOs</b>	Market Return	IPO Timing	Sector	Company Age	Market	Over Under
MarketReturn	1,00					
IPO Timing	-0,03	1,00				
Sector	-0,01	0,16	1,00			
CompanyAge	0,06	0,15	-0,02	1,00		
Market	-0,06	-0,23	0,26	-0,11	1,00	
OverUnder	0,03	0,00	-0,28	0,04	-0,17	1,00

<b>Swedish IPOs</b>	Market Return	IPO Timing	Sector	Company Age	Market	Over Under
MarketReturn	1,00					
IPO Timing	0,08	1,00				
Sector	-0,07	-0,04	1,00			
CompanyAge	0,02	-0,10	-0,11	1,00		
Market	-0,15	0,06	0,11	-0,39	1,00	
OverUnder	-0,04	-0,05	-0,09	0,18	-0,13	1,00

### Appendix 2. Breusch-Pagan test for heteroskedasticity

Brausch-Pagan test for heteroskedasticity, model for the Finnish IPOs	
chi2	3,27
Prob > chi2	0,07

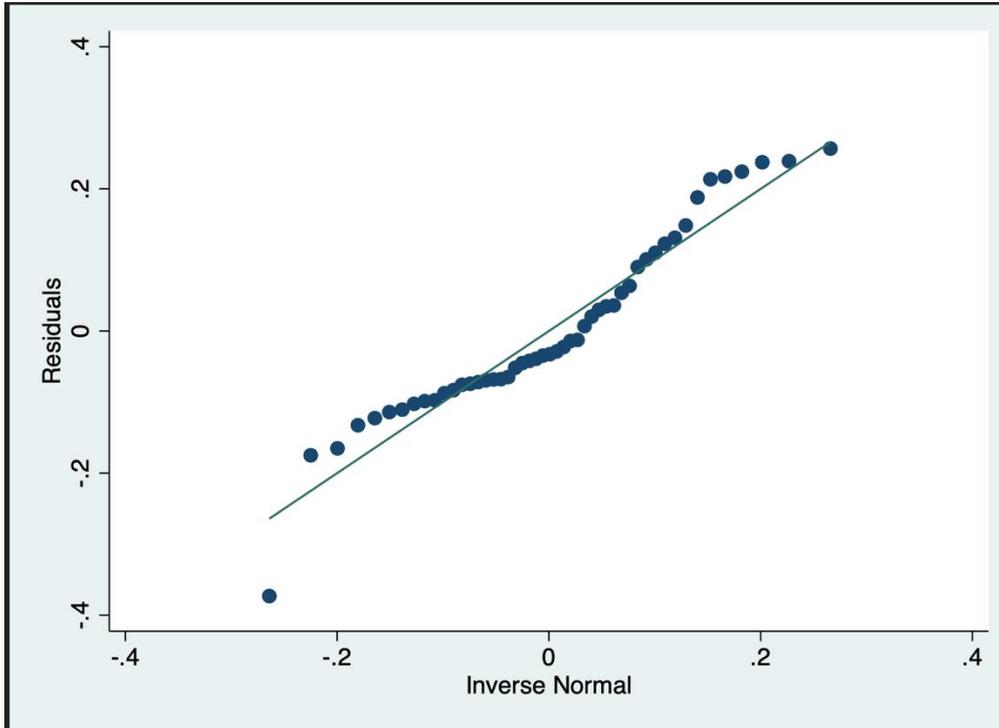
Brausch-Pagan test for heteroskedasticity, model for the Swedish IPOs	
chi2	1,54
Prob > chi2	0,21

## Appendix 3. Shapiro-Wilk W test for normal data

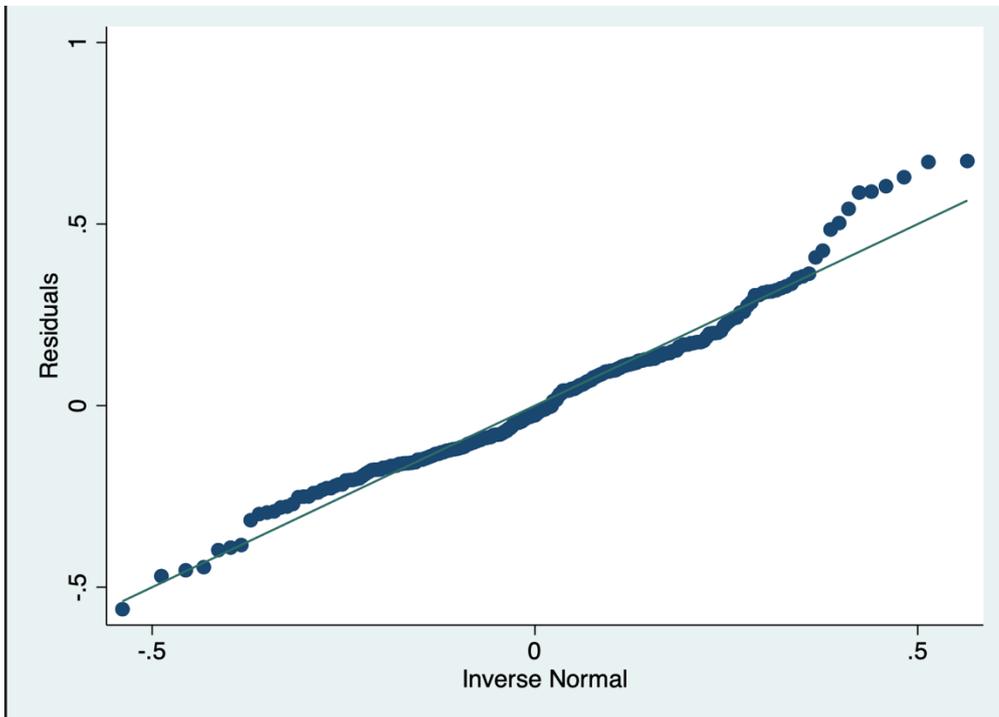
Shapiro-Wilk W test for normal data, Finnish dataset					
Variable	Obs	W	V	z	Prob > z
Residuals	49	0,94	2,63	2,06	0,02

Shapiro-Wilk W test for normal data, Swedish dataset					
Variable	Obs	W	V	z	Prob > z
Residuals	243	0,97	4,73	3,61	0,00

## Appendix 4. Q-Q Plots of residuals

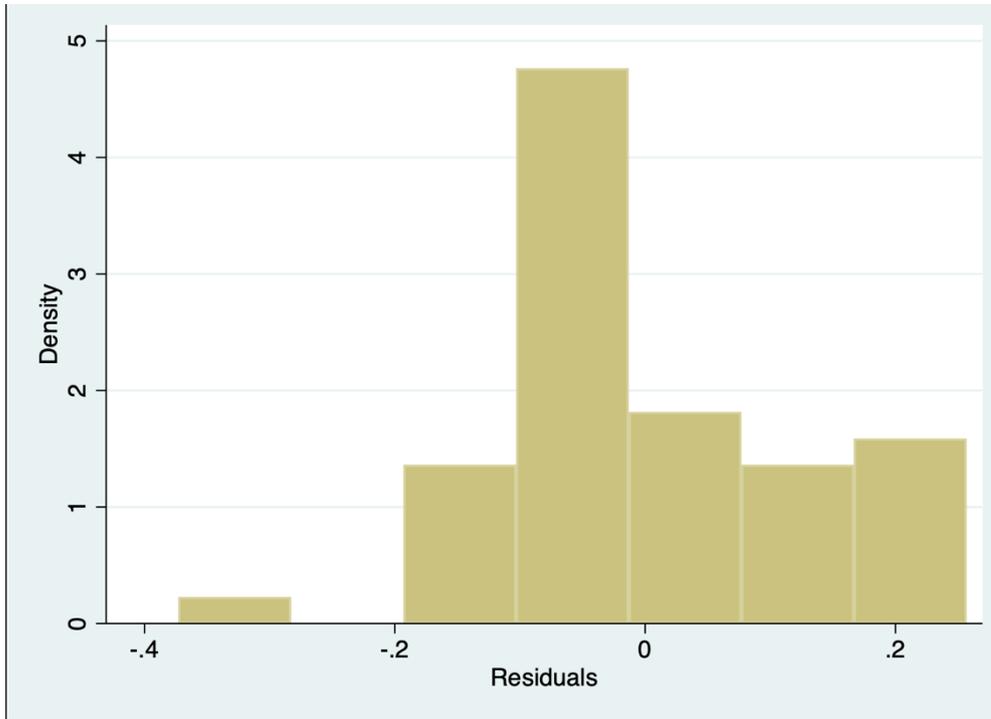


Finland

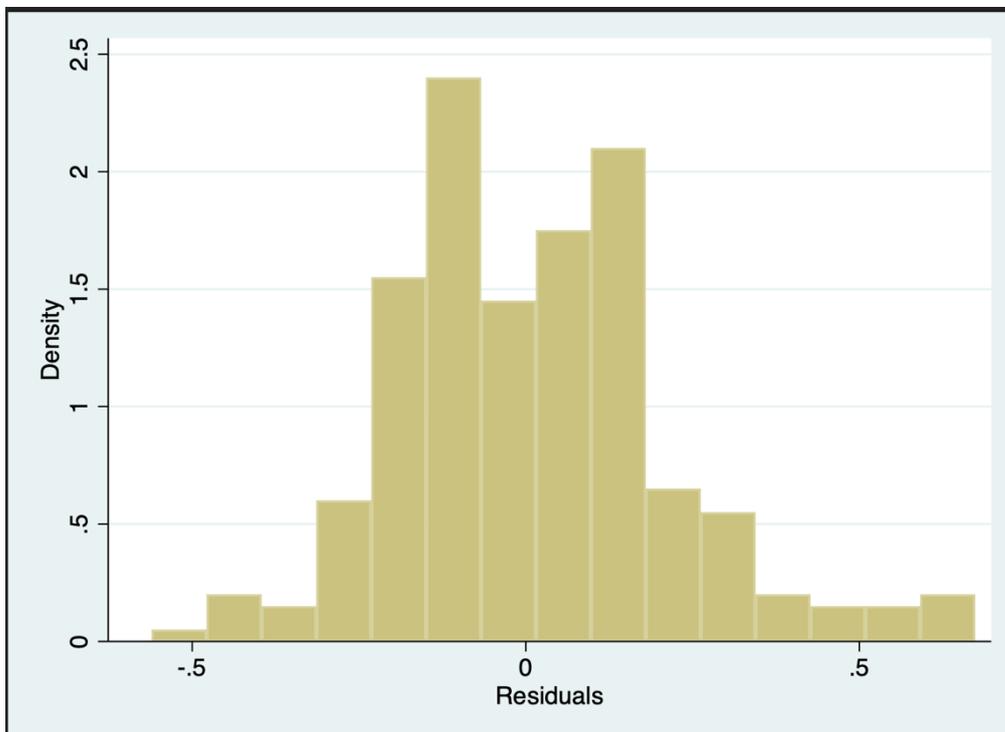


Sweden

## Appendix 5. Histograms of residuals



Finland



Sweden

Appendix 6. List of companies included in the sample, former company names in brackets.

No.	Company Name	IPO Date	Initial Return	Return of the whole period
1	Newton Nordic AB	13.1.2015	-0,63 %	-93,75 %
2	Eltel AB	6.2.2015	-35,94 %	-48,92 %
3	Dustin group ab	13.2.2015	9,83 %	99,50 %
4	Organoclick AB	16.2.2015	5,15 %	70,63 %
5	Lexington Company AB	18.2.2015	39,40 %	-42,43 %
6	Sdiptech AB	4.3.2015	3,75 %	19,04 %
7	Piippo Oyj	10.3.2015	11,73 %	-55,85 %
8	Detection Technology Oyj	16.3.2015	-4,34 %	481,85 %
9	Cantargia AB	17.3.2015	11,74 %	206,17 %
10	Hoist Finance AB	25.3.2015	13,97 %	-47,35 %
11	Enento (Asiakastieto Group) Oyj	27.3.2015	-5,53 %	143,28 %
12	Troax group AB	27.3.2015	19,32 %	964,76 %
13	K2A Knaust & Andersson Fastigheter AB	2.4.2015	8,80 %	25,00 %
14	Tobii AB	24.4.2015	34,77 %	96,63 %
15	Spiffbet AB	27.4.2015	-74,50 %	-79,00 %
16	Robit Oyj	21.5.2015	8,60 %	-15,02 %
17	Clean Motion AB	26.5.2015	23,69 %	-84,03 %
18	Paradox Interactive AB	31.5.2015	34,55 %	305,41 %
19	SciBase Holding AB	2.6.2015	-42,13 %	-80,92 %
20	Corline Biomedical AB	3.6.2015	40,90 %	14,07 %
21	Gaming Corps AB	4.6.2015	-0,86 %	-95,65 %
22	Pihjalainna Oyj	4.6.2015	9,52 %	-1,74 %
23	Collector AB	10.6.2015	-24,64 %	-11,99 %
24	Inission AB	10.6.2015	0,58 %	357,96 %
25	Heimstaden AB	11.6.2015	-8,03 %	15,19 %
26	Talenom Oyj	11.6.2015	-12,20 %	1225,91 %
27	Nilörngruppen AB	12.6.2015	-3,20 %	65,70 %
28	Alimak group ab	17.6.2015	-0,24 %	50,47 %
29	Nobina AB	18.6.2015	-5,88 %	142,81 %
30	Padox AB	18.6.2015	1,04 %	32,77 %
31	Kontigo Care AB	23.6.2015	-31,09 %	-22,09 %
32	Pegroco invest AB	24.6.2015	2,00 %	-11,37 %
33	SolTech Energy Sweden AB	25.6.2015	-25,00 %	348,75 %
34	Headsent (Capacent Holding) AB	2.10.2015	24,07 %	54,63 %
35	Sinch (CLX Communications) AB	8.10.2015	6,49 %	2191,90 %
36	Bravida Holding AB	16.10.2015	7,50 %	187,91 %
37	Minesto AB	9.11.2015	15,50 %	208,29 %
38	Waystream Holding AB	12.11.2015	-1,70 %	18,38 %
39	Photocat AB	20.11.2015	9,31 %	-40,54 %
40	Dometic Group AB	25.11.2015	15,42 %	163,09 %

41	Attendo AB	30.11.2015	40,00 %	-44,06 %
42	EAB Oyj	30.11.2015	2,53 %	-32,90 %
43	TC Tech Sweden AB	30.11.2015	83,65 %	-46,19 %
44	Immunovia AB	1.12.2015	60,51 %	235,92 %
45	Evli Pankki Oyj	2.12.2015	24,00 %	124,61 %
46	Scandic Hotel Group AB	2.12.2015	-4,85 %	-47,56 %
47	Camurus AB	3.12.2015	6,01 %	254,15 %
48	Stillfont Group AB	8.12.2015	78,21 %	1083,45 %
49	Consti Oyj	10.12.2015	3,16 %	30,10 %
50	Vicore Pharma Holding AB	10.12.2015	-13,50 %	297,86 %
51	Nilsson Special Vehicles AB	11.12.2015	-16,17 %	-74,23 %
52	Xbrane Biopharma AB	3.2.2016	-20,81 %	338,57 %
53	Catena Media AB	11.2.2016	13,60 %	82,24 %
54	Garo Ab	16.3.2016	39,73 %	478,43 %
55	LeoVegas AB	17.3.2016	14,69 %	3,54 %
56	Humana AB	22.3.2016	19,35 %	-9,19 %
57	Xintela AB	22.3.2016	-21,85 %	-42,68 %
58	Next Game Oyj	23.3.2016	17,15 %	-81,52 %
59	Simris Alg AB	22.4.2016	-35,95 %	-92,40 %
60	Nepa	26.4.2016	43,41 %	-11,11 %
61	Lehto Group Oyj	28.4.2016	-4,51 %	-66,28 %
62	Resurs Holding AB	29.4.2016	-7,01 %	-23,27 %
63	Tokmanni	29.4.2016	0,00 %	248,06 %
64	Qt Group Oyj	2.5.2016	-22,62 %	2376,79 %
65	Cyxone AB	7.6.2016	16,98 %	-16,31 %
66	PiezoMotor Uppsala AB	9.6.2016	-14,00 %	428,37 %
67	Enorama Pharma AB	11.6.2016	-40,60 %	142,18 %
68	B3 Consulting Group (B3IT Management) AB	13.6.2016	3,50 %	13,62 %
69	Swedencare AB	14.6.2016	28,57 %	3094,44 %
70	TF Bank AB	14.6.2016	10,39 %	110,12 %
71	AcadeMedia AB	15.6.2016	42,42 %	41,84 %
72	Skarta Group (Privanet Group) Oyj	15.6.2016	-20,88 %	-79,78 %
73	GomSpace Group AB	16.6.2016	-48,00 %	167,38 %
74	Alelion Energy Systems AB	21.6.2016	-43,62 %	-46,19 %
75	Expres2ion Biotech Holding AB	29.7.2016	-14,89 %	674,32 %
76	Maha Energy AB	29.7.2016	-24,39 %	270,30 %
77	InDex Pharmaceuticals Holding AB	11.10.2016	-16,67 %	-78,94 %
78	Vincit Group Oyj	17.10.2016	41,70 %	68,87 %
79	Gasporox AB	25.10.2016	-0,42 %	17,16 %
80	Bico Group (Cellink) AB	3.11.2016	109,69 %	3012,25 %
81	Heeros Oyj	10.11.2016	-9,68 %	130,71 %
82	Crunchfish AB	11.11.2016	79,29 %	67,32 %
83	Gapwaves AB	18.11.2016	23,92 %	812,79 %

84	Embracer Group (THQ Nordic) AB	22.11.2016	35,00 %	2472,22 %
85	Alligator Bioscience AB	23.11.2016	3,01 %	-84,95 %
86	Serneke AB	24.11.2016	-1,49 %	-54,92 %
87	AdderaCare AB	1.12.2016	37,60 %	-35,49 %
88	ByggPartner i Dalarna Holding AB	5.12.2016	0,27 %	99,73 %
89	Scandinavian ChemoTech AB	6.12.2016	-10,42 %	-52,00 %
90	Smart Eye AB	7.12.2016	31,52 %	309,92 %
91	Acarix AB	19.12.2016	-37,50 %	-87,64 %
92	AAC Clyde Space AB	21.12.2016	-10,74 %	-57,08 %
93	SeaTwirl AB	22.12.2016	-18,50 %	287,73 %
94	Vo2 Cap Holding AB	22.12.2016	-44,01 %	-87,00 %
95	Oncopeptides AB	22.2.2017	-6,52 %	117,09 %
96	IRLAB Therapeutics AB	28.2.2017	-3,42 %	229,59 %
97	Hemcheck Sweden AB	15.3.2017	0,83 %	-53,06 %
98	ChromoGenics AB	23.3.2017	-66,43 %	-96,42 %
99	MIPS AB	23.3.2017	11,96 %	1329,13 %
100	Unibap AB	27.3.2017	31,02 %	79,74 %
101	Biovica International AB	29.3.2017	-4,40 %	291,63 %
102	Ambea AB	31.3.2017	-0,67 %	-14,50 %
103	Fondia Oyj	4.4.2017	28,50 %	-22,69 %
104	Isofol Medical AB	4.4.2017	-6,90 %	-66,00 %
105	Tangiamo Touch Technology AB	6.4.2017	-28,70 %	-79,05 %
106	Actic Group AB	7.4.2017	0,99 %	-67,35 %
107	Intervacc AB	7.4.2017	-25,75 %	937,04 %
108	FM Mattsson Mora Group AB	10.4.2017	38,24 %	85,64 %
109	Sonetel AB	12.4.2017	2,23 %	-79,45 %
110	Annexin Pharmaceuticals AB	19.4.2017	-65,21 %	-69,97 %
111	XMReality AB	26.4.2017	-8,47 %	-53,35 %
112	Bambuser AB	5.5.2017	-34,78 %	165,67 %
113	Mantex AB	5.5.2017	-49,43 %	-43,18 %
114	Instalco AB	11.5.2017	18,18 %	446,15 %
115	Secits Holding AB	11.5.2017	-31,04 %	-13,48 %
116	Kamux Oyj	12.5.2017	5,00 %	114,68 %
117	Integrum AB	15.5.2017	0,90 %	301,88 %
118	Munters Group AB	19.5.2017	20,09 %	15,82 %
119	Bioservo Technologies AB	22.5.2017	-33,54 %	-19,37 %
120	Medicover AB	23.5.2017	16,96 %	258,02 %
121	Remedy Entertainment Oyj	29.5.2017	18,41 %	606,28 %
122	TerraNet Holding AB	30.5.2017	-16,54 %	-83,50 %
123	Boozt AB	31.5.2017	25,00 %	142,58 %
124	Zaplox AB	8.6.2017	-2,78 %	-91,38 %
125	Paxman Ab	12.6.2017	14,74 %	393,58 %
126	Enersize Oyj	15.6.2017	-4,89 %	-97,04 %

127	Nitro Games AB	16.6.2017	1,00 %	-66,88 %
128	Surgical Science Sweden AB	19.6.2017	64,29 %	1343,48 %
129	Bonesupport Holding AB	21.6.2017	10,34 %	135,00 %
130	Sedana Medical AB	21.6.2017	22,05 %	1100,00 %
131	Promore Pharma AB	3.7.2017	-48,88 %	-83,32 %
132	OXE Marine AB	4.7.2017	-35,45 %	-74,84 %
133	Urb-it AB	7.7.2017	-24,50 %	-60,71 %
134	Aspire Global PLC	11.7.2017	6,67 %	89,69 %
135	Netmore Group AB	14.7.2017	-54,05 %	-62,80 %
136	Realfiction Holding AB	14.7.2017	11,58 %	146,46 %
137	Seamless Distribution Systems AB	21.7.2017	-5,56 %	32,65 %
138	SenzaGen AB	21.9.2017	117,78 %	-56,21 %
139	XSpray Pharma AB	28.9.2017	42,73 %	212,10 %
140	Rovio Entertainment Oyj	29.9.2017	0,00 %	-40,17 %
141	Balco Group AB	6.10.2017	16,96 %	64,89 %
142	Titanium Oyj	9.10.2017	13,33 %	100,86 %
143	Terveystalo Oyj	11.10.2017	2,46 %	12,70 %
144	Bioarctic AB	12.10.2017	20,83 %	375,17 %
145	Climeon AB	13.10.2017	44,19 %	-44,07 %
146	Fram Skandinavien AB	13.10.2017	50,75 %	-1,82 %
147	Artificial Solutions International AB	13.11.2017	-44,31 %	-97,60 %
148	Gofore Oyj	16.11.2017	7,09 %	166,91 %
149	Irras AB	22.11.2017	-16,44 %	-86,80 %
150	2CureX AB	24.11.2017	-2,44 %	112,35 %
151	Awardit AB	5.12.2017	36,43 %	275,65 %
152	Tempest Security AB	6.12.2017	-9,09 %	89,00 %
153	DevPort AB	7.12.2017	-44,29 %	24,10 %
154	Efecte Oyj	8.12.2017	-6,00 %	190,14 %
155	MAG Interactive AB	8.12.2017	-5,68 %	5,54 %
156	Acconeer AB	11.12.2017	35,20 %	53,55 %
157	Scout Gaming Group AB	11.12.2017	52,17 %	-21,71 %
158	Lyko Group AB	12.12.2017	3,00 %	451,46 %
159	Atvexa AB	13.12.2017	13,00 %	65,31 %
160	Bio-Works Technologies AB	14.12.2017	9,64 %	25,62 %
161	FlexQube AB	14.12.2017	2,33 %	41,69 %
162	Admicon Oyj	9.2.2018	9,18 %	703,74 %
163	Liv ihop AB	23.2.2018	0,00 %	-62,00 %
164	Cibus Nordic Real Estate AB	9.3.2018	2,64 %	101,98 %
165	Builddata Group (Zutec) AB	15.3.2018	-1,25 %	-69,32 %
166	Harvia Oyj	22.3.2018	0,00 %	920,00 %
167	Green Landscaping Holding AB	23.3.2018	-0,57 %	286,97 %
168	BHG Group (Bygghemma Group First) AB	27.3.2018	-11,58 %	294,05 %
169	Iconovo AB	6.4.2018	-6,49 %	113,33 %

170	Fluicell AB	18.4.2018	1,33 %	68,75 %
171	Infrea AB	20.4.2018	-13,64 %	134,74 %
172	Enersense Oyj	24.4.2018	-10,17 %	96,23 %
173	Ovzon AB	18.5.2018	-37,50 %	51,77 %
174	JonDeTech Sensors AB	25.5.2018	-30,31 %	-5,38 %
175	I-Tech AB	28.5.2018	20,34 %	156,99 %
176	NCAB Group AB	5.6.2018	0,67 %	492,72 %
177	Better Collective A/S	8.6.2018	25,93 %	198,53 %
178	Kojamo Oyj	15.6.2018	0,59 %	125,38 %
179	Eezy (VMP) Oyj	18.6.2018	4,40 %	19,16 %
180	Projektengagemang Sweden AB	19.6.2018	0,02 %	-47,25 %
181	Midsummer AB	21.6.2018	39,81 %	-41,10 %
182	Ranplan Group AB	28.6.2018	-22,33 %	-15,00 %
183	Calliditas Therapeutics AB	29.6.2018	4,42 %	166,01 %
184	Raketech Group Holding Plc	29.6.2018	-5,00 %	-37,19 %
185	Asarina Pharma AB	24.9.2018	77,14 %	-87,66 %
186	Fellow Finance Oyj	10.10.2018	2,20 %	-55,70 %
187	Rush Factory Oyj	16.11.2018	0,00 %	-27,00 %
188	Viafin Service Oyj	20.11.2018	-5,86 %	150,38 %
189	AlzeCure Pharma AB	28.11.2018	-21,43 %	-25,00 %
190	S2Medical AB	28.11.2018	31,03 %	-67,63 %
191	Nordic ID Oyj	30.11.2018	-14,63 %	-29,28 %
192	Oma Säästöpankki Oyj	30.11.2018	2,14 %	93,71 %
193	Jetpak Top Holding AB	5.12.2018	-6,00 %	167,14 %
194	Lime Technologies AB	6.12.2018	4,17 %	334,13 %
195	Q-linea AB	7.12.2018	-0,90 %	113,38 %
196	Azelio AB	10.12.2018	-47,23 %	334,97 %
197	CAG Group AB	12.12.2018	-4,24 %	35,13 %
198	InCoax Networks AB	3.1.2019	-54,30 %	-44,09 %
199	LeadDesk Oyj	15.2.2019	40,91 %	180,00 %
200	Ascelia Pharma AB	13.3.2019	-0,48 %	41,68 %
201	Ferroamp Elektronik AB	22.3.2019	17,50 %	322,87 %
202	Teqnion AB	4.4.2019	50,00 %	93,85 %
203	Aallon Group Oyj	8.4.2019	34,39 %	27,40 %
204	Triboron International AB	8.4.2019	117,05 %	-92,25 %
205	Karnov Group AB	11.4.2019	3,02 %	18,74 %
206	Upsales Technology AB	24.4.2019	32,64 %	194,72 %
207	OssDsign AB	24.5.2019	-16,36 %	-61,87 %
208	Vertiseit AB	28.5.2019	10,46 %	70,41 %
209	John Mattson Fastighetsföretagen AB	5.6.2019	13,33 %	0,00 %
210	Mentice AB	18.6.2019	37,96 %	27,22 %
211	Inzile AB	27.6.2019	4,71 %	287,00 %
212	Lipidor AB	27.9.2019	12,33 %	140,36 %

213	EQT AB	16.10.2019	30,93 %	254,08 %
214	Relais Group Oyj	17.10.2019	-0,68 %	157,82 %
215	ZignSec AB	21.10.2019	6,60 %	275,22 %
216	Transcendent Group AB	22.10.2019	-10,97 %	-23,91 %
217	Fodelia Oyj	26.11.2019	20,93 %	45,00 %
218	K-Fast Holding AB	29.11.2019	55,26 %	130,03 %
219	Optomed Oyj	5.12.2019	1,78 %	204,59 %
220	24Storage AB	10.12.2019	12,98 %	-23,54 %
221	M.O.B.A. Network AB	12.12.2019	-29,63 %	48,95 %
222	QleanAir AB	12.12.2019	-1,25 %	67,09 %
223	Kollect on Demand Holding AB	19.12.2019	0,00 %	-12,50 %
224	Veg of Lund AB	10.2.2020	-9,91 %	183,55 %
225	Musti Group Oyj	13.2.2020	17,71 %	203,11 %
226	Nord Insuretech Group (Hudya) AB	14.2.2020	-70,18 %	-89,27 %
227	Train Alliance Sweden AB	20.2.2020	10,44 %	55,02 %
228	Qlife Holding AB	2.3.2020	-25,37 %	335,73 %
229	Stayble Therapeutics AB	9.3.2020	-37,48 %	-1,43 %
230	Bilot Oyj	17.3.2020	-5,37 %	12,30 %
231	Invajo International AB	14.5.2020	-29,11 %	0,47 %
232	Magle Chemoswed Holding AB	30.6.2020	0,85 %	42,89 %
233	Exsitec Holding AB	16.9.2020	69,11 %	219,65 %
234	Readly International AB	17.9.2020	10,17 %	-46,28 %
235	Implantica AG	21.9.2020	48,55 %	13,09 %
236	Lifeclean International AB	1.10.2020	6,17 %	-33,63 %
237	GPX Medical AB	2.10.2020	4,69 %	-43,51 %
238	Wästbygg Gruppen AB	13.10.2020	10,42 %	-1,51 %
239	Bomill AB	20.10.2020	-18,08 %	-19,02 %
240	Nordic Paper Holding AB	22.10.2020	-2,33 %	2,50 %
241	Lohilo Foods AB	26.10.2020	23,41 %	7,92 %
242	Prostatype Genomics AB	3.11.2020	-27,46 %	99,43 %
243	Fortinova Fastigheter AB	19.11.2020	5,59 %	-3,03 %
244	Luxbright AB	19.11.2020	0,00 %	-6,18 %
245	Stenhus Fastigheter i Norden AB	24.11.2020	1,00 %	43,56 %
246	Nordnet AB	25.11.2020	9,38 %	37,57 %
247	Re:NewCell AB	26.11.2020	51,32 %	54,43 %
248	Thunderful Group AB	7.12.2020	40,00 %	-17,00 %
249	Circhem AB	9.12.2020	-19,51 %	131,82 %
250	Fasadgruppen Group AB	9.12.2020	27,50 %	67,06 %
251	Scandinavian Biogas Fuels International AB	16.12.2020	-3,97 %	-2,80 %
252	Ellwee AB	19.1.2021	28,80 %	-53,11 %
253	Nimbus Group AB	9.2.2021	31,54 %	7,46 %
254	Fractal Gaming Group AB	11.2.2021	48,73 %	-29,08 %
255	Cint Group AB	19.2.2021	38,89 %	-3,80 %

256	Kreate Group Oyj	19.2.2021	30,37 %	-5,52 %
257	Lipigon Pharmaceuticals AB	1.3.2021	-5,36 %	-25,09 %
258	Ytrade Group AB	9.3.2021	-4,44 %	-16,28 %
259	CoinShares International Ltd.	11.3.2021	143,21 %	-17,58 %
260	Ekobot AB	15.3.2021	-27,27 %	-24,50 %
261	RugVista Group AB	18.3.2021	0,00 %	30,88 %
262	Nightingale Health Oyj	19.3.2021	-23,70 %	12,04 %
263	Fantasma Games AB	23.3.2021	26,70 %	5,76 %
264	Embellence Group AB	24.3.2021	3,57 %	13,79 %
265	Idun Industrier AB	25.3.2021	104,65 %	63,07 %
266	Orthex Oyj	25.3.2021	8,65 %	28,48 %
267	Sitowise Group Oyj	25.3.2021	0,12 %	4,02 %
268	Hexicon AB	26.3.2021	0,98 %	11,94 %
269	LMK Group AB	29.3.2021	3,79 %	-12,74 %
270	Pharmiva AB	31.3.2021	-34,31 %	-6,09 %
271	Euroafrica Digital Ventures AB	6.4.2021	-29,38 %	-11,28 %
272	Plexian AB	14.4.2021	-18,40 %	-9,31 %
273	Dlaboratory Sweden AB	21.4.2021	-34,64 %	-12,24 %
274	Lipum AB	22.4.2021	-28,55 %	-10,21 %
275	Hemnet Group AB	27.4.2021	53,51 %	9,04 %
276	Modelon AB	28.4.2021	5,91 %	-13,95 %
277	Tellusgruppen AB	28.4.2021	7,25 %	-12,82 %
278	Nilar International AB	30.4.2021	0,00 %	-14,93 %
279	Alexandria Pankkiiriliike Oyj	11.5.2021	26,28 %	-14,69 %
280	Duearity AB	11.5.2021	5,71 %	-11,41 %
281	Safello Group AB	12.5.2021	175,56 %	-58,76 %
282	Twiiik AB	19.5.2021	-36,55 %	-2,85 %
283	Checkin.com Group AB	20.5.2021	161,29 %	95,06 %
284	Talkpool AG	24.5.2021	28,18 %	-46,63 %
285	Arla Plast AB	25.5.2021	26,09 %	-7,24 %
286	Cedergrenska AB	25.5.2021	0,00 %	-11,00 %
287	Linc AB	29.5.2021	26,87 %	8,71 %
288	Mildef Group AB	4.6.2021	1,10 %	0,54 %
289	Netum Group Oyj	4.6.2021	39,06 %	-6,07 %
290	Permascand Top Holding AB	4.6.2021	8,00 %	7,57 %
291	Merus Power Oyj	8.6.2021	19,57 %	48,81 %
292	Ngenic AB	8.6.2021	-15,73 %	-12,69 %
293	Sleep Cycle AB	8.6.2021	12,14 %	-4,46 %
294	Savelend Credit Group AB	9.6.2021	19,47 %	-19,64 %
295	SOZAP AB	9.6.2021	80,94 %	23,66 %
296	Maven Wireless Sweden AB	10.6.2021	10,38 %	-5,92 %
297	Elicera Therapeutics AB	11.6.2021	-22,50 %	-24,68 %
298	Toivo Group Oyj	11.6.2021	21,29 %	-2,63 %

299	Aventura Group AB	14.6.2021	-3,54 %	-3,74 %
300	RVRC Holding AB	16.6.2021	17,07 %	-11,08 %
301	TH1NG AB	16.6.2021	-20,91 %	-14,71 %
302	Acast AB	17.6.2021	-0,79 %	-9,55 %
303	Codemill AB	18.6.2021	-10,26 %	-0,29 %
304	Hexicon AB	18.6.2021	4,65 %	-4,44 %
305	Physitrack PLC	18.6.2021	16,25 %	-7,74 %
306	Solwers Oyj	18.6.2021	11,33 %	-14,25 %
307	LL Lucky Games AB	23.6.2021	21,88 %	8,40 %
308	OX2 AB	23.6.2021	-8,33 %	1,82 %
309	Biosergen AB	24.6.2021	-29,60 %	3,69 %
310	Emplicure AB	24.6.2021	-18,08 %	-3,22 %
311	Intellego Technologies AB	24.6.2021	-40,83 %	44,60 %
312	Puulo Oyj	24.6.2021	10,00 %	7,99 %
313	Spinnova Oyj	24.6.2021	25,00 %	5,58 %
314	USWE Sports AB	24.6.2021	-31,16 %	38,29 %
315	Linkfire A/S	28.6.2021	-2,68 %	-0,92 %