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SHORT-TERM PERFORMANCE AND UNDERPRICING OF IPOS IN NASDAQ HELSINKI DURING 2013-2021

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ABSTRACT

This thesis aims to investigate Initial Public Offering (IPO) short-term performance and underpricing during 2013-2021 in the Finnish IPO market. The empirical study sample consists of 83 firms listed on Nasdaq Helsinki Main Market and First North Growth Market, and the chosen benchmark index is OMX Helsinki Price Index.

The theoretical framework includes an overview of IPOs, IPO underpricing and theories explaining motives for underpricing. Additionally, Nasdaq Helsinki and IPO process in Finland are discussed. Moreover, prior literature and empirical research are presented. Due to the nature of this research, the empirical study has a quantitative approach. To measure IPO underpricing, raw initial returns and market-adjusted returns are calculated. Multiple linear regression analysis is executed to investigate a robustness of the relationship between seven explanatory variables and underpricing. Furthermore, wealth relatives are calculated 1 month, 3 months, 6 months, and 1 year after the initial offering to evaluate the short-term performance of IPOs.

The average (median) market-adjusted return during 2013-2021 is 7.30% (3.11%), indicating that underpricing is prevalent in the Finnish stock market. Wealth relatives including the first trading day returns imply that IPOs outperform the market index during first year after the initial offering. According to the linear regression model, from quarterly GDP growth rate, market capitalization, offering size, industry, firm age, investment size, and listing venue, only investment size has a statistically significant inverse relationship with underpricing.

Keywords: Initial public offering, underpricing, short-term performance, regression, Nasdaq Helsinki

INTRODUCTION

An Initial Public Offering (IPO) is a process in which a private company offers its shares to the general public for the first time (Ritter 1998). During the initial offering, a company goes public, and its shares can be traded on a stock exchange. In most cases, the principal motivation for a company going public is to raise external equity capital for financing future investments and operations (FFSP 2016).

The year 2021 was exceptional in the IPO markets. The IPO volume and proceeds increased globally by 64 % and 67 %, respectively, compared to 2020. The high IPO activity in 2021 was driven by increased liquidity in the market due to expansionary monetary policy, high valuations, historically low interest rates, and investor optimism (EY 2021). Favourable market conditions attracted 29 private companies to pursue IPOs on Nasdaq Helsinki, breaking the latest record from the year 1999 (Kauppalehti.fi 2022).

Plenty of research on IPOs has been conducted during the past decades. The aim of this thesis is to examine short-term performance and underpricing of IPOs in Nasdaq Helsinki during 2013-2021. Underpricing is observed by calculating raw initial returns and market-adjusted initial returns of IPOs. Wealth relative values are calculated 1 month, 3 months, 6 months, and 1 year after IPOs to assess the first year performance. Furthermore, a multiple linear regression model is used to analyse how quarterly gross domestic product growth rate, market capitalization, offering size, industry, firm age, investment size, and listing venue affect underpricing.

To reach the aim of this study, the following three research questions will be answered:

1. Are IPOs in Nasdaq Helsinki underpriced during 2013-2021?
2. How have IPOs performed during the first year after the initial offering?
3. How do firm and offering specific attributes and market conditions affect the level of underpricing?

The paper is structured as follows. The body of the paper consists of three main chapters: theoretical framework, data and methodology and empirical study. The theoretical framework provides an overview of IPOs and IPO underpricing, followed by theories explaining motives for underpricing, and an overview of IPO waves and "hot issue markets". Additionally, this chapter includes past research findings and a discussion of Nasdaq Helsinki and the IPO process in Finland. The second chapter presents the data and sample as well as definitions of variables selected for the regression analysis. Additionally, calculations and statistical methods used for the empirical study are presented, followed by the empirical analysis. Finally, the conclusion summarises the main findings and includes suggested practical implications for further research.

1. THEORETICAL FRAMEWORK

The following section provides a general overview of IPOs, IPO underpricing and motives and theories explaining underpricing. Furthermore, this section discusses IPO waves, Nasdaq Helsinki and the IPO process in Finland. An additional objective is to present prior literature and research regarding IPOs as a short-term investment.

1.1. Initial Public Offering (IPO)

Initial Public Offering (IPO) enables a company to raise additional capital by selling its shares to public investors. Besides raising equity capital by issuing new primary shares, the existing shareholders can sell their stocks, referred to as "secondary shares". Only the issuance of primary shares increases the capital inflow, whereas already existing shareholders selling secondary shares offload their holdings, changes the ownership structure of a company (Kim, Weisbach 2008) and generates liquidity in the market (Espinasse 2014). Often, both secondary and primary shares are offered when an IPO occurs (Geddes 2003).

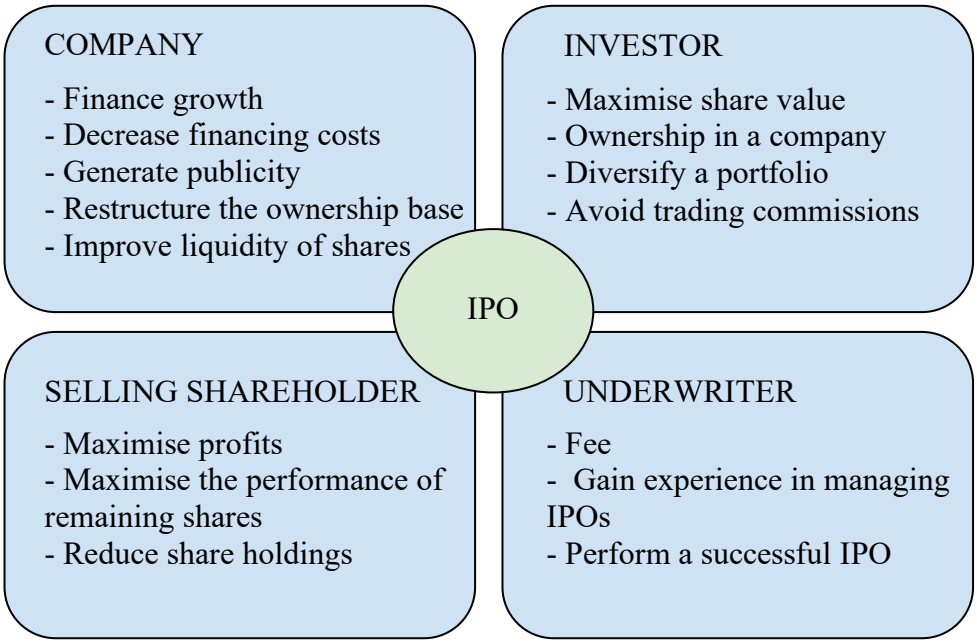

Figure 1. IPO objectives of the main parties involved
Source: FFSP (2016); Espinasse (2014); Geddes (2003).

There are several underlying motives for equity offerings, such as finance growth, lower the cost of capital, enhance company's reputation, increase the liquidity of shares, and change in the capital structure of a company (FFSP 2016). Four prominent parties are involved in an IPO: a company, investors, existing (selling) shareholders and the main underwriter (Geddes 2003; FFSP 2016). The motives of IPO slightly differ between the main parties involved in the process, as presented above in figure 1.

A main underwriter works closely with the issuing firm, and its primary responsibility is the distribution of shares to the public. Another essential duty the underwriter has is valuating the company correctly to determine an attractive offering price. Besides the main underwriter, several external experts assist the company during the IPO process regarding the due diligence, legal requirements, and financial matters (FFSP 2016). An underwriter may avoid arranging an IPO for a company with an unstable financial position, bad reputation, or poor business strategy to keep up a good reputation as an IPO manager.

1.2. IPO Underpricing

The offering price of a share needs to be set at a level that attracts investors in order to raise sufficient equity capital through an IPO. IPO underpricing refers to a situation in which the initial

offering price of a share is set below its true market value (Jenkinson et al. 2001, 4). In this case, investors participating in the IPO benefit from underpricing by earning high returns on the first day of trading since the first trading day closing price of a share rises higher than the initial offering price (Ritter 1998).

Fama's (1970) efficient market hypothesis (EMH) is a key concept in modern financial theory. In an efficient market, all new information that is relevant to determine the value of a firm is "immediately" and "fully reflected" in the prices of securities. In general terms, it is virtually impossible for an investor to gain returns below or above major market indexes, as all securities trade at their current fair market value (Fama 1970). Thus, IPO underpricing is inconsistent with EMH as the initial offerings provide average returns higher than the market average during the first days of trading.

Previous literature presents several theories explaining the underpricing phenomenon. Ljungqvist (2007) suggests that these theories can be segregated into four groups: theories related to information asymmetry, institutional factors, behavioural aspects, and ownership aspects. This paper provides an overview of Rock's (1986) winner's curse theory, Allen and Faulhaber's (1989), Grinblatt and Hwang's (1989), and Welch's (1989) signalling theories and Welch's (1992) bandwagon hypothesis. Moreover, the literature review discusses IPO waves and "hot issue markets".

1.2.1. Winner's curse theory

Rock (1986) developed a "Winner's curse" theory to explain why underpricing exists. The theory divides investors into two groups, informed and uninformed investors, based on their knowledge of the true value of the offering. According to the theory, well-informed investors participate in IPOs only if they expect shares to be traded at a premium over the offering price. In turn, uninformed investors participate in all IPOs, regardless of the pricing of the offering (Rock 1986).

Higher demand for underpriced IPOs leads to oversubscription of shares, meaning that investors receive only a part of the shares they subscribed to. In the case of an overpriced IPO, uninformed investors acquire the majority of the shares subscribed due to low demand from well-informed investors. This creates an "adverse selection" problem, and uninformed investors may withdraw from the market as they suffer from losses from overpriced IPOs. In contrast, informed investors only gain returns from underpriced IPOs. Rock argues that underwriters must compensate for the

"adverse selection" problem by underpricing the issues in order to attract uninformed investors to stay in the new-issue market. Otherwise, the new-issue market would be fully populated by informed investors (Rock 1986).

Winner's curse theory has received empirical support from several authors. For instance, Levis (1990) found evidence from the United Kingdom market that overpriced IPOs decrease the overall profits and that it is difficult to gain excess returns from oversubscribed IPOs. Keloharju (1993) examined 80 IPOs from the uninformed investor's point of view in the Finnish stock market. The study was based on an assumption that an uninformed investor would participate in all IPOs with fixed order sizes. He documented uninformed investors receiving large proportions from overpriced IPOs and smaller allocations from offerings with positive returns.

Beatty and Ritter (1986) extended the winner's curse theory by arguing that ex-ante uncertainty regarding the true value of the offering and the expected underpricing are positively associated. Their model proposes that a high level of underpricing is caused by greater ex-ante uncertainty, which is caused by high information asymmetry and speculation regarding the fair market value of the offering. Several academics have examined a relationship between ex-ante variables' and initial returns to measure the degree of ex-ante uncertainty. Ljungqvist (2007) divides the proxies measuring the degree of ex-ante uncertainty into four groups: firm characteristics, offering characteristics, prospectus disclosure and security characteristics.

1.2.2. Signalling theories

Ibbotson (1975) studied motives for underpricing and argued that if a company succeeded in "leaving a good taste in investors' mouths" by underpricing the IPO, investors would be willing to pay a higher price for subsequent offerings. Based on this assumption, Allen and Faulhaber (1989) presented a signalling theory suggesting that underpricing of new securities occurs at specific periods and in particular industries. According to the theory, the company itself has superior information about its future prospects. By selling the new issues at a discount, the company wishes to send positive signals to investors that the company is a lucrative investment with bright prospects. Only high-quality companies can perform an underpriced IPO as they can bear the losses from underpricing the issues by pursuing a Seasoned Equity Offering (SEO) later on. In turn, low-quality firms have difficulties recouping the losses from underpricing if the firm's true value is revealed before the SEO. Similar to the winner's curse theory, signalling is based on the assumption of information asymmetry.

Grinblatt and Hwang's (1989), and Welch's (1989) theories support signalling for being a motivation for underpricing. However, Welch's (1989) theory differentiates in a way that low-quality firms suffer losses by mimicking high-quality firms. Prior research provides evidence of the existence of signalling in an IPO market. For instance, Álvarez and Gonzáles (2005) examined Spanish IPO market returns and found a positive relationship between underpricing and the volume of funds raised through SEO.

Ritter (2011) assessed signalling theories critically by arguing that high-quality companies could send positive signals to investors in more efficient and less costly ways. Additionally, signalling considers the information asymmetry only between IPO issuers and investors, while neglecting the information asymmetry between uninformed and informed investors, investors and underwriters, and issuing firms and underwriters (Ritter 2011). Several authors, including Spiess and Pettway (1997), Garfinkel (1993), and Kennedy et al. (2006) provide empirical evidence showing that the high level of underpricing does not result in exceptionally successful SEO, which is contrary to the three signalling theories.

1.2.3. The bandwagon hypothesis

According to Welch (1992), a bandwagon ('cascade') effect occurs when investors in the IPO market mimic the behaviour of earlier investors and ignore their own knowledge of the offering. In this case, even if a potential investor possesses positive private information about an IPO, she might withdraw from subscribing to IPO if other investors are acting so. Correspondingly, early investors' purchasing decisions might encourage subsequent investors to subscribe to an IPO. Thus, the bandwagon hypothesis assumes that the level of demand from early investors can quickly determine the fate of the offering. An issuer may underprice the initial offer to induce enough early investors to create a bandwagon effect (Welch 1992).

1.2.4. IPO waves

The number of IPOs fluctuates from year to year. Figure 2 below illustrates this time-series variation in the number of IPOs during the years 2013-2021 in Finland. This figure shows only the primary offerings, meaning that the shares are sold to the public for the first time. The data imply that in 2013 and 2020, only three companies went public, whereas in 2021, 27 companies went public, and the IPO activity was significantly higher compared to the years 2013-2020. The term

"IPO wave" refers to the increased activity in the IPO markets (Pástor, Veronesi 2005) and is illustrated as a peak in a graph.

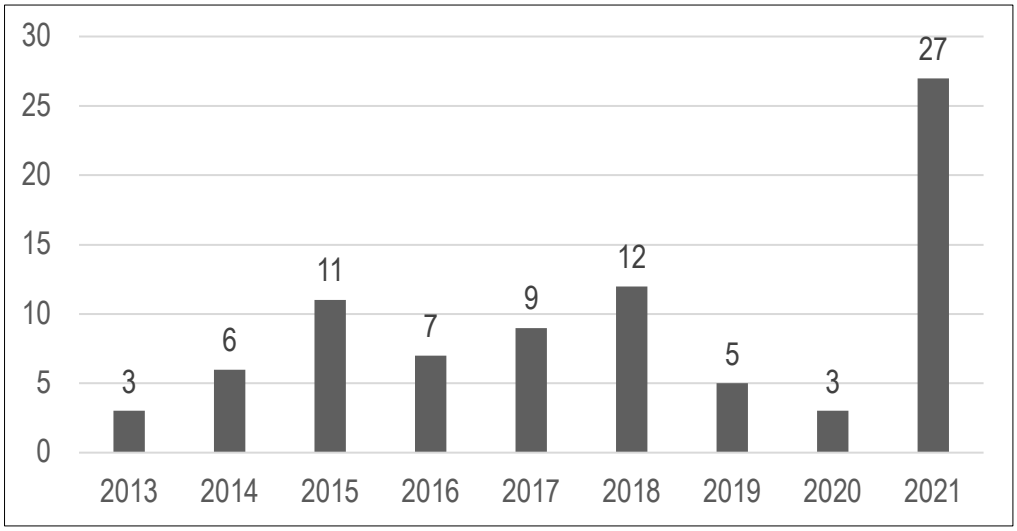

Figure 2. Number of IPOs in Finland during 2013-2021
Source: author's calculations based on data from Appendix 1

"Hot issue market" refers to a period when the IPO activity and initial returns are abnormally high (Ibbotson, Jaffe 1975). Various authors have examined the underlying reasons behind the IPO fluctuation and "hot issue markets". Lowry et al. (2002) summarise that the high IPO activity is followed by periods of abnormally high initial returns. This autocorrelation is driven by underwriters not reflecting the information learned during the IPO registration procedure fully into the offering prices of shares. Pástor and Veronesi (2005) empirical study supports similar findings, indicating that high market returns follow IPO waves, and that the market returns and IPO activity decline after the wave. They conclude that this simply happens because companies wait for market conditions to improve before pursuing an IPO. Additionally, their model shows that the increasing discrepancy between old and new firms' valuation and return volatility anticipate IPO waves. Ritter (1984) examined the US IPO market from 1960 to 1982, and found 3 to 4 periods when the average initial return was substantially high and each of these periods followed by an increase in IPO activity. He documents that in 15 month period, from the beginning of the 1980s, the average initial return was 48.8%, which was exceptionally high in the US new-issue market.

Previous studies explain private companies exercising the option to pursue IPOs when the market conditions are favourable, which usually occurs when the economy is in an expansionary phase (Choe et al. 1993). According to Lowry's (2003) study findings, firms tend to pursue the option to

go public during expansionary phases because the demand for capital is high, and investors enjoy endless optimism in the market. In other words, the IPO volume is associated with companies' capital demand and investors' mindset. Ljungqvist (1997) and Yung et al. (2008) also document that the average level of underpricing is higher when the economy is in an expansionary phase, meaning that IPO volume is positively associated with the level of underpricing.

1.3. IPO short-term performance

It has been discovered globally that IPOs are underpriced on average, see table 1 below (Loughran et al., 1994, updated 2020). In the footsteps of Stoll and Curley (1970), Reilly (1973) and Logue (1973), several academics globally, including Ibbotson (1975), Ljungqvist (2007), and Logue et al. (2002), have documented that IPOs are underpriced on average.

Table 1. IPO underpricing in selected 38 countries (sample size ≥ 100)

Country	Sample size	Time period	Initial Return
Australia	2069	1976-2018	19.8%
Austria	106	1971-2018	6.2%
Belgium	154	1984-2017	11.0%
Brazil	303	1979-2018	30.3%
Canada	758	1971-2017	6.4%
China	3798	1990-2019	169.5%
Denmark	173	1984-2017	7.4%
Finland	209	1971-2018	14.2%
France	834	1983-2017	9.7%
Germany	779	1978-2014	23.0%
Greece	373	1976-2013	50.8%
Hong Kong	2042	1980-2017	44.5%
India	3145	1990-2017	85.2%
Indonesia	531	1990-2017	26.4%
Iran	279	1991-2004	22.4%
Israel	348	1990-2006	13.8%
Italy	413	1985-2018	13.1%
Japan	3756	1970-2019	46.8%
Korea	2007	1980-2018	55.2%
Malaysia	562	1980-2018	51.0%
Mexico	149	1987-2017	9.9%
Netherlands	212	1983-2017	13.3%
New Zealand	269	1979-2018	15.9%
Nigeria	125	1989-2017	12.8%
Norway	266	1984-2018	6.7%
Philippines	173	1987-2018	17.3%
Poland	350	1991-2019	11.7%
Singapore	687	1973-2017	25.8%
South Africa	342	1980-2018	17.2%
Spain	199	1986-2018	9.2%
Sri Lanka	134	1987-2018	28.9%
Sweden	405	1980-2015	25.9%
Switzerland	164	1983-2018	25.2%
Taiwan	1915	1980-2019	37.2%
Thailand	697	1987-2018	40.0%
Turkey	404	1990-2014	9.6%
UK	5185	1959-2016	15.8%
US	13,244	1960-2019	16.9%

Source: Loughran et al. (1994, updated 2020)

Table 1 shows that underpricing phenomenon prevails in all 38 sample countries over several decades. The level of average underpricing varies from 6.2% in Austria to 169.5% in China. During 1971-2018, the average underpricing in Finland was 14.2%. Table 1 shows that underpricing has cross-country variation. According to Loughran et al. (1994, updated 2020),

variation in initial returns is related to binding market regulations and mechanisms, timing, and firms' characteristics.

The pricing and performance have been previously studied in the Finnish IPO market. Prior studies by Keloharju (1993), Westerholm (2006), and Hahl et al. (2014) provide empirical evidence that Finnish IPOs are underpriced on average. Keloharju (1993) examined 80 IPOs during the years 1984-1989 and documented a market-adjusted initial return of 8.7%. Furthermore, Westerholm (2006) studied empirically a sample of 63 IPOs issued during 1991-2002, finding an average initial return of 21.9%. Hahl et al. (2014) sample consisted of 67 IPOs issued during 1994-2002, and they documented underpricing of 15.6%.

Table 2. IPO returns 1 year after the initial offering

Author(s)	Country	Sample size	Time period	1 year return
Ritter (1991)	US	1501	1975-1984	-10.23%
Lee et al. (1996)	Australia	263	1976-1989	-13.5%
Hahl et al. (2014)	Finland	67	1994-2006	3.00%
Álvarez and Gonzáles (2005)	Spain	52	1987-1997	6.11%

Although IPOs provide abnormally high average initial returns, Ritter (1991) documented that in a three-year period, IPOs have on average underperformed the market index in the US. The same study found that young firms substantially underperformed the market during a three-year period. Similar empirical evidence of IPO long-term underperformance is documented by Keloharju (1993) in Finland and Levis (1990) in the UK. Table 2 shows the first-year returns in four countries. Generally, returns one year after the IPO are lower in all four countries than initial returns in table 1.

1.4. Nasdaq Helsinki

Nasdaq Helsinki is the only licensed and regulated securities marketplace in Finland. A company may be listed in Nasdaq Helsinki either on the Main Market or the First North Growth Market (First North GM). These are two separate trading venues with slightly different requirements for the companies reaching the capital markets (FFSP 2016).

As stated earlier, 2021 was a record-breaking year in the IPO markets globally. In Finland, 29 firms pursued an IPO and 27 of those firms offered stocks to the general public for the first time. Figure 3 illustrates the trading venue division and the sum of yearly IPO proceeds in millions during 2013-2021 in Finland. By observing the division of listings between the two trading venues, the data implies that since 2014, the First North GM has been a more attractive marketplace among companies pursuing an IPO. The difference is particularly significant in 2021 when 21 companies were listed on the First North GM while only 6 went public on the Main Market.

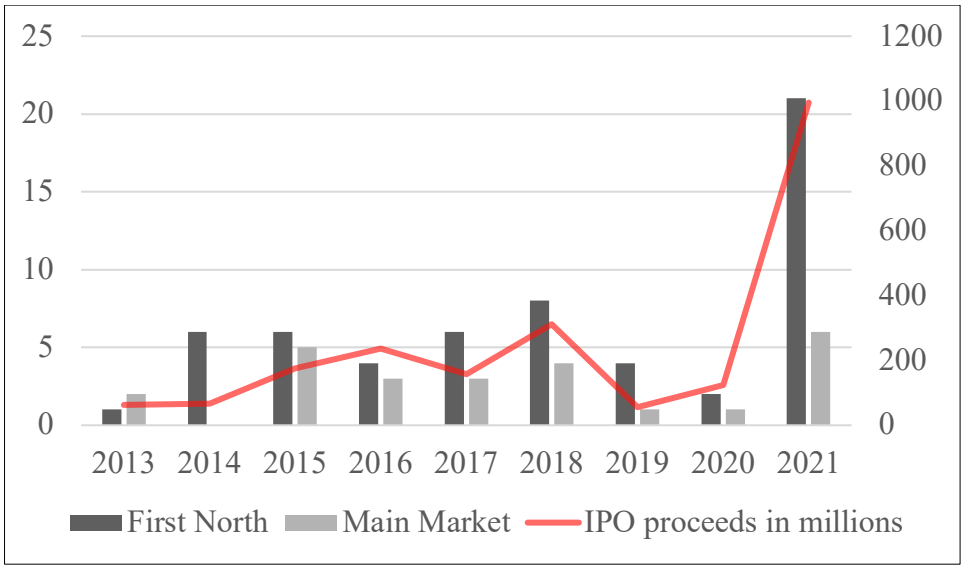

Figure 4. Trading venue division and IPO proceeds in millions during 2013-2021
Source: author's calculations based on data from Appendices 1 and 2

The IPO proceeds in figure 3 refer to capital raised by companies, and therefore excludes the additional secondary shares offered. In 2021, companies raised 995 million euros through IPOs, which is a significantly higher amount compared to years 2013-2020.

The Nasdaq Helsinki Main Market practically includes larger companies having the ability to meet the higher requirements and costs pre-IPO as well as after the IPO. Firms listed on the Main Market are divided into three groups according to the size of market capitalization (MCAP): Large Cap (MCAP > 1 billion), Medium Cap (MCAP > 150 million), and Small Cap (MCAP < 150 million) (FFSP 2016; Nasdaq 2020, updated 2021).

The First North GM has fewer reporting requirements, and it is primarily targeted to smaller companies aiming for growth while benefiting from being a listed company. Companies on the First North GM can be traded in the Nasdaq Helsinki exchange similarly to shares on the Main

Market. The shares on the First North GM tend to be riskier and less liquid since the trading activity is lower compared to the Main Market. It is relatively common for firms seeking better visibility to transfer from the First North GM to the Main Market (FFSP 2016). At the end of 2021, 53 companies were listed on the First North GM (Nasdaq 2022).

1.4.1. IPO process in Finland

Going public is an exhaustive procedure, including several steps from planning to the beginning of trading on an exchange. As the requirements and regulations regarding IPOs are country-specific, the focus is on the listing process in Finland. However, the process follows similar steps in every IPO market. Irrespective of whether the company decides to go public in the Main Market or the First North GM, the process can be divided into three stages presented below in the figure 4.

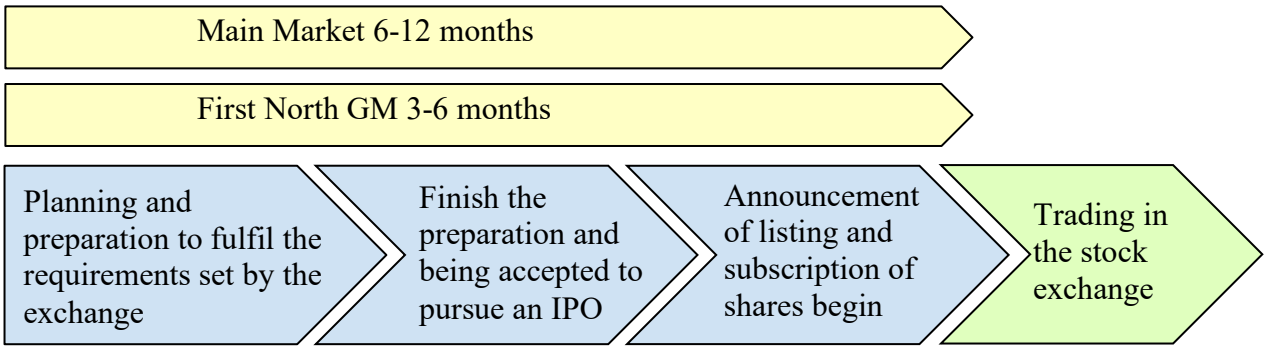

Figure 5. IPO process in Nasdaq Helsinki
Source: FFSP (2016); FSA (2020).

To begin with, the company must fulfil specific requirements laid out by the stock exchange the company intends to list on. The first stage, planning and preparation, includes, for instance, preparing financial statements in accordance with the accounting standards set by the stock exchange, due diligence to evaluate risks and possibilities of a business, and agreements with underwriters (FFSP 2016;FSA 2020).

The second step covers finishing the preparation, setting terms of the IPO, following the regulative guidelines (FFSP 2016), and finishing the company prospectus, which is thereafter being accepted either by the financial supervisory authority or the stock exchange (FSA 2020). At this point, the company may publicly declare the intention to list so that investors and analysts have the ability to evaluate the firm as an investment (FFSP 2016).

The final stage is close to the beginning of trading in a stock exchange. During the last phase, the company offers shares to the institutional and private investors, including the declaration of share allocation. Since this point, the company is required to offer transparent disclosures of financial statements and other company operations to the public. At least one day before the trading begins, the exchange announces the result of the IPO (FFSP 2016). After this, the trading shall begin.

In general, the pre-trading IPO process when issuing shares to the Main Market usually takes from 6 months up to 12 months, and for the First North GM from 3 to 6 months. The time frame varies depending on the fluency of the administrative matters and to what extent the company fulfils the requirements set out by the exchange before starting the IPO process (FFSP 2016). Finnish Financial Supervisory Authority (FSA) supervises the Main Market and First North GM to ensure the functionality of these markets (FSA 2020).

Without exception, pursuing an IPO is always a costly procedure. According to Ritter (1998), these costs can be divided into indirect and direct costs. Direct costs include legal and auditing costs as well as a fee paid to the underwriter, which is usually the largest single direct expenditure (FFSP 2016). Indirect costs refer to 'leaving money on the table' as usually, on the first day of trading, the share's market price rises higher than the offering price and investors gain this excess return. Furthermore, the IPO process requires time commitment and resources from the management and other parties involved. These costs are defined as indirect costs (Ritter 1998). Costs also occur post-IPO as the company is obliged to provide transparent disclosures to uphold the listing (Espinasse 2014).

2. DATA AND METHODOLOGY

The following section presents the data, sample and methodologies used in this research. The study relies on the methods used in previous similar academic papers and is conducted using a quantitative approach due to the nature of this study. Through calculating and applying several statistical methods, the intention is to examine one year performance of IPOs in the Nasdaq Helsinki during 2013-2021. Additionally, this section examines how a firm and offering specific attributes and market conditions impact the level of underpricing.

2.1. Data collection and sampling

The total sample of this research consists of 83 firms listed in Nasdaq Helsinki Main Market and First North GM during a nine-year period from April 4, 2013, through December 12, 2021. The sample consists of only primary listings in which the shares have been offered to private and institutional investors for the first time. Therefore, secondary listings and directed issues are excluded from the data. If a company has transferred from the First North GM to the Main Market, the primary offering on the First North GM is included in the sample.

The data on initial offering prices and issuing dates are retrieved from companies' prospectuses, annual reports, websites, and press releases. To observe short-term performance of IPOs, companies' unadjusted closing prices are collected 1 day, 1 month, 3 months, 6 months and 1 year after the initial offering. OMX Helsinki Price Index (OMXHPI) is used as a benchmark of market performance during the examined period. OMXHPI includes all shares listed on the Nasdaq Helsinki and excludes dividends. The closing prices of shares and OMXHPI are collected from Thomson Reuters Eikon datastream. If price data is not available for a specific date, the data for the following possible day is used.

Five companies included in the sample have executed a stock split or a reverse stock split during the examined period. Therefore, initial offering prices are adjusted based on the company releases

concerning the stock splits. For instance, in 2015, *Verkkokauppa.com* increased the number of shares of existing shareholders by issuing five additional shares for each share held.

2.2. Regression variables

Multiple linear regression model is used to examine how quarterly GDP growth rate (GDP), market capitalization (MCAP), offering size (SIZE), industry (TECH), firm age (AGE), investment size (INV) and listing venue (LIST) affect underpricing (MAIR). Table 3 provides the definitions of the variables used for multivariate analysis. Log-transformation is used to reduce right skewness of the independent variables (skewness > 1).

Table 3. Variables for multiple regression analysis

Independent variable	Definition	Expected sign
Quarterly GDP growth rate (GDP)	Describes the change in a country's economic output by comparing GDP to the previous year	+
Market capitalization (MCAP)*	Market value of equity at the time of an IPO, number of outstanding shares multiplied by the offering price of a share	− / +
Offering size (SIZE)*	Gross IPO proceeds, number of primary shares issued multiplied by the offering price of a share	−
Firm age (AGE)**	IPO year minus the year of founding	−
Industry (TECH)***	Dummy variable. 1 = firm is classified as a technology firm, otherwise = 0	+
Investment size (INV)	Monetary amount invested in an IPO	−
Listing venue (LIST)***	Dummy variable. 1 = Main Market, 0 = First North GM	−
Dependent variable		
Underpricing (MAIR)	Market-adjusted initial return of IPO, calculated according to section 2.2.	

Note: *logarithm, **log(1+age), ***dummy variable

To measure the prevailing market conditions in Finland, quarterly Gross Domestic Product growth rates (GDP) for the period of 2013Q2-2021Q4 are collected from Statistics Finland's free-of-charge statistical database. For the reason that IPOs were not held in 2013Q1, the data on quarterly GDP growth rate is not collected from that period. Previous studies suggest that in expansionary economic phases, the level of underpricing is higher (Choe et al. 1993). Additionally, La Porta et al. (1997) found that macroeconomic variables, such as GDP growth, positively correlate with the IPO activity. Based on previous studies, the relationship between quarterly GDP growth rate (GDP) and underpricing (MAIR) is expected to be positive.

Data on market capitalization (MCAP) at the time of an IPO is collected from companies' prospectus and press releases. If data is not available, company's market capitalization is calculated by multiplying the number of outstanding shares by the offering price. Ibbotson et al. (1994) and How et al. (1995) document an inverse relationship between market capitalization and underpricing in the US and Australian IPO market, respectively. This is in line with the assumption of smaller firms experiencing higher initial returns due to ex-ante uncertainty regarding the true market value of the offering. However, the relationship between the market value of a company and underpricing is not straightforward. For instance, Clarkson and Mendley (1994) document a positive relationship between market capitalization and underpricing in Canada. The positive association is in consonance with signalling theories according to which only high-quality companies may signal their lucrative prospects by underpricing the issues. Companies with large market capitalization are generally more stable and well-reputed than companies with small market capitalization. In line with previous research and presented theories, the relationship between market capitalization (MCAP) and underpricing (MAIR) can be expected to be either positive or negative.

Data on offering size (SIZE) is collected on companies' prospectus declaring the IPO result. Offering size (SIZE) refers to gross IPO proceeds which indicates the total amount of money a company raises from the issuance. In previous studies, offering size is used as a proxy to measure ex-ante uncertainty (Beatty, Ritter 1986; Carter et al 1998). Smaller offerings are expected to give higher returns than large offerings, since more risk is involved. Islam et al. (2010) and Samarakoon (2010) found empirical evidence of the inverse relationship between offering size and underpricing in the Chittagon's and Sri Lanka's IPO market, respectively. Based on assumption of ex-ante uncertainty and previous studies, the assumption is that offering size (SIZE) and underpricing (MAIR) have an inverse relationship.

Firm age (AGE) is calculated by deducting the founding year from the year of IPO. Firm age is a widely used proxy in previous research considering the ex-ante uncertainty regarding the value of the offering. Ritter (1984) defines firm age being a proxy to measure how "established" a firm is. In other words, older companies are less difficult to value since more information about the company's operations and financials is available. To repeat, usually, firms with higher uncertainty regarding the true value of the offering experience higher underpricing, and therefore the relationship between firm age (AGE) and underpricing (MAIR) is expected to be negative.

In previous studies, industry classification is a common way to examine initial and longer-term returns (Loughran, Ritter 2004; Ritter 1991). Therefore, initial returns are examined by classifying sample firms into industries according to Industry Classification Benchmark (ICB) used by Nasdaq. The empirical study results in technology firms providing significantly higher level of underpricing (MAIR) than other firms. Due to this result, the relationship between the industry dummy variable (TECH) and underpricing (MAIR) is examined. A dummy variable (TECH) gets a value of 1 if a company is classified as a technology firm (otherwise = 0). The expected association between the industry (TECH) variable and underpricing (MAIR) is positive.

Rock's (1986) Winner's curse hypothesis suggests that underpriced offerings are often oversubscribed. In turn, an investor often receives the requested amount of shares on an overpriced IPOs (Rock 1986). The relationship between investment size (INV) and underpricing (MAIR) is investigated to examine the existence of winner's curse in the Finnish IPO market. The investment size is determined by calculating how many shares an uninformed investor received if she participated with fixed investment of 5000€ in all IPOs during 2013-2021. The fixed investment of 5000€ is selected as being an amount of money that a private, uninformed investor could invest into one IPO. In Finland, the share allocation can be found in the prospectus declaring the result of an IPO. For instance, in the case of *Kempower Oyj* IPO, the initial offering price was 5.74€, and therefore the investor's initial subscription was 871 shares. According to the company prospectus, a private investor received shares subscribed up to 10 shares and 2.5% of the excess 861 shares. Therefore, the investor received only 32 shares, and the investment size was 184 €. In accordance with the Winner's curse theory, the relationship between investment size (INV) and underpricing (MAIR) is expected to be negative.

Trading venue (LIST) is a dummy variable that gets a value of 1 if a firm is listed on the Main Market (otherwise = 0, First North firm). As described earlier, companies listed on First North GM

are smaller and more riskier than companies listed on the Main Market. Based on the assumption of greater ex-ante uncertainty leading to higher underpricing, the association between listing venue (LIST) and underpricing (MAIR) is expected to be negative.

2.3. Methodology

This study has a quantitative approach since the aim is to empirically evaluate the short-term performance of IPOs by utilising different calculating and statistical methods. This section presents the methodologies applied for measuring IPO short-term performance. Methods of calculating initial returns, wealth relatives and multiple linear regression are presented below. Multiple linear regression is used to assess the effect of firm and offering specific attributes as well as market conditions on underpricing.

2.3.1. IPO underpricing

The amount of underpricing can be calculated by subtracting the initial offering price of a share from the first day closing price at which the share trades in the aftermarket in a following way:

$$UP = P_{i,t} - OP_i \qquad (1)$$

where
UP – underpricing,
$P_{i,t}$ – the unadjusted first trading day closing price of share i,
OP_i – the offering price of share i.

If UP > 0 (UP < 0), the offering is underpriced (overpriced) and if UP = 0, the share is considered as correctly priced. To measure underpricing effectively, it is preferably to calculate raw initial return as a percentage in the following way:

$$IR_i = \frac{(P_{i,t} - OP_i)}{OP_i} \times 100 \qquad (2)$$

where
IR_i – raw initial return of share i,
$P_{i,t}$ – unadjusted first trading day closing price of share i,
OP_i – offering price of share i.

Raw initial return allows the relative comparison of returns. However, it does not take into account the market performance during the corresponding period. Therefore, market-adjusted initial return (MAIR), a measure used by Ritter (1991), is applied to assess the first trading day returns. MAIR

can be calculated by subtracting the benchmark adjusted return from the raw initial return in the following way:

$$MAIR_i = \left[\frac{(P_{i,t} - OP_i)}{OP_i} - \frac{(M_t - M_{t,0})}{M_{t,0}}\right] \times 100 \qquad (3)$$

where
$MAIR_i$ – market-adjusted initial return of share i,
M_t – first trading day closing value of benchmark index,
$M_{t,0}$ – a closing value of benchmark index one day before the first trading day.

The chosen benchmark index is OMXHPI, which includes all shares listed on Nasdaq Helsinki.

2.3.2. Measuring IPO short-term performance

The short-term performance of IPOs is measured by using Ritter's (1991) Wealth Relative (WR) model. WR values are calculated 1 month, 3 months, 6 months and 1 year after the initial offering. As price data is not available for weekends and national holidays, 1 month consists of 21 days, 3 months of 63 days, 6 months of 126 days, and 1 year of 252 days. WR value of a share can be calculated in the following way:

$$WR_i = \frac{(1 + r_{i,t})}{(1 + r_{m,t})} \qquad (4)$$

where
WR_i – wealth relative value of share i,
$r_{i,t}$ – return of share i in period t,
$r_{m,t}$ – return of benchmark index m in period t.

A wealth relative greater than 1.00 indicates that IPO has outperformed the benchmark index (OMXHPI) over the specified period. Correspondingly, if a wealth relative is below 1.00, the benchmark index has outperformed the IPO (Ritter 1991). The assumption is that a stock is bought once and held passively throughout the examined period ("buy-and-hold strategy"). For each period, WR values are calculated twice: by including and excluding the first day returns. By doing so, it is possible to evaluate the influence of underpricing on the longer-term returns. For instance, Keloharju (1993) and Hahl et al. (2014) calculated WR values by including and excluding the initial returns.

As stated earlier, in an efficiently functioning market, the stock returns should not differ from the market returns. If MAIR gets a value of 0, the initial return does not differ from the market return.

Therefore, one-sample t-test is used to observe if the average MAIR significantly differs from a hypothesised value of 0. Additionally, one-sample t-test is applied to determine whether the average WR differs statistically significantly from a hypothesised value of 1. Both t-tests are run by assuming unequal variances.

The first assumption is that the average market-adjusted return (MAIR) does not differ from the hypothesised value of 0 in examined period of *d* (day 1). Thus, the following hypotheses are tested:

$H_{0,1} = \overline{MAIR_d} = 0$

$H_{a,1} = \overline{MAIR_d} \neq 0$

The second assumption is that the average WR in each time period (WR) does not differ from the hypothesised value of 1 in examined period of *d* (1 month, 3 months, 6 months, 1 year). Therefore, the following hypotheses are stated:

$H_{0,2} = \overline{WR_d} = 1$

$H_{a,2} = \overline{WR_d} \neq 1$

Student's t-test is applied to test hypotheses stated above:

$$t = \frac{m - \mu}{s \,/\, \sqrt{n}} \qquad (5)$$

where
t – student's t-test
m – mean
μ – hypothesised value
s – standard deviation
n – number of observations

The following equations (6) and (7) show the student's t-test applied for MAIR and WR to test the hypotheses stated above:

$$t = \frac{\overline{MAIR_d} - 0}{s/\sqrt{n}} \qquad (6)$$

$$t = \frac{\overline{WR_d} - 1}{s/\sqrt{n}} \qquad (7)$$

2.3.3. Regression model

Inspired by theories explaining underpricing and previous empirical studies, the objective is to assess firm and offering specific attributes', as well as one macroeconomic variable's effect on underpricing. The objective is to investigate how quarterly GDP growth rate (GDP), market capitalization (MCAP), offering size (SIZE), industry (TECH), firm age (AGE), investment size (INV), and listing venue (LIST) effect on underpricing (MAIR). Definitions of these variables are presented in section 2.2..

A multiple linear regression model is used to analyse the relationships between mentioned independent variables and the dependent variable. Montgomery et al. (2012) present the multiple linear regression model with the following equation:

$$y_r = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \varepsilon \qquad (8)$$

where
y_r – MAIR
β_0 – y-intercept
β_n – the slope
x_1 – quarterly GDP growth rate (GDP)
x_2 – market capitalization (MCAP)
x_3 – offering size (SIZE)
x_4 – industry (TECH)
x_5 – firm age (AGE)
x_6 – investment size (INV)
x_7 – listing venue (LIST)
ε – error variable describing the difference between y-intercept (β_0) and the slope (β_n)

3. EMPIRICAL STUDY

This section presents the results of the empirical study made in accordance with the methods presented in the previous chapter. The focus is to examine first-year performance of IPOs and evaluate if firm and offering specific attributes, as well as market conditions, affect the level of underpricing. First, descriptive statistics of raw initial returns (IRs), market-adjusted returns (MAIRs), and explanatory variables are presented. Additionally, average MAIRs are presented by grouping the sample according to listing venue, market capitalization, offering size, age, and industry. In the subsequent section, first-year performance of IPOs is examined, followed by a multiple regression analysis and a discussion.

3.1. Descriptive statistics

This part includes descriptive statistics of raw initial returns (IRs), market-adjusted returns (MAIRs), and explanatory variables. Additionally, average MAIR is investigated by grouping the sample by listing venue, market capitalization, offering size, age, and industry.

Table 4. Descriptive statistics of raw initial returns (IR) and market-adjusted initial returns (MAIR)

	IR	MAIR
Mean	7.24%	7.30%
Median	2.75%	3.11%
Standard deviation	0.19	0.19
Minimum	-33.33%	-34.43%
Maximum	75.76%	76.06%
n	83	83
T-value	-	3.58
P-value	-	0.000

Source: author's calculations based on data from Appendix 1

Table 4 shows the main descriptive statistics of IR and MAIR. Additionally, student's t-test is applied for MAIR to test the hypotheses presented in section 2.3.2.. The average (median) IR of IPOs is 7.24% (2.75%), whereas the average (median) MAIR is 7.30% (3.11%). Average values of initial return measures are higher than medians, indicating that the initial returns are skewed on the right.

The range of both initial return measures is notably large. *Inderes Oyj* IPO gave the highest MAIR of 76.06%, and *FIT Biotech Oyj* the lowest MAIR of -34.43%. By examining MAIRs, 56 (67%) IPOs are underpriced while 27 (33%) are overpriced (see Appendix 1).

Student's t-test output is a t-statistic of 3.58, indicating that average MAIR is higher than the hypothesised value of 0. As p-value is 0.000 (< 0.01), the result is statistically significant at the 0.99 confidence level and the null hypothesis $H_{0,1}$ (MAIR = 0) is rejected. Therefore, it can be stated that the market has not been functioning efficiently, as the average MAIR significantly differs from hypothesised value of 0.

Table 5. Descriptive statistics of independent variables (excluding dummy variables)

	Mean	Median	Standard deviation	Minimum	Maximum	n
GDP, %	1.1%	1.0%	0.0	-6.8%	7.8%	35
MCAP, (millions)	161.3	67.3	288.6	9.4	2101	83
SIZE, (millions)	26.3	15.0	31.3	0.39	150	83
AGE, (years)	18.6	14.0	15.6	0	73	83
INV, (euros)	2788.1	2750.0	1817.7	183.7	5000.0	83

Source: author's calculations based on data from Appendices 1 and 2

Table 5 shows the main descriptive statistics of independent variables, excluding dummy variables of industry (TECH) and listing venue (LIST). The quarterly GDP growth rate (GDP) average (median) is 1.1%, (1.0%), meaning that the economic output on average increased quarterly by 1.1% compared to previous year during 2013Q2-2021Q4. In 2021Q2, the economic output increased by 7.8% compared to 2020Q2, when the GDP growth declined -6.8% from the previous year. In 2020, the principal reason for weak economic conditions was the COVID-19 pandemic.

Company market capitalization (MCAP) at the time of an IPO ranged from 9.4 millions (*Rush Factory Oyj*) to 2101 million (*Kojamo Oyj*). The market capitalization median of 67.3 million addresses the middle value of an arranged data set of market capitalization. As the average market capitalization of 161.3 is over two times greater than the median, the market capitalization is highly skewed on the right.

The average (median) of offering size (SIZE) is 26.3 (15) million. The largest offering of 150 million was issued by *Kojamo Oyj*, whereas *Consti yhtiöt Oyj* issued the smallest offering of 0.39 million. The offering size (SIZE) includes only primary shares issued, meaning that some offerings appear very small even a larger allocation of shares would have been sold to the public as secondary shares.

The average (median) firm age (AGE) is 18.6 (14) years, indicating that firms going public in the Finnish IPO market are relatively mature firms with several years of experience. However, two sample firms (*Fodelia Oyj, Lifeline SPAC Oyj*) went public the same year as they were founded, giving the minimum firm age value of 0. *Piippo Oyj* was the oldest firm, being founded 73 years before the IPO.

The average investment size (INV) average (median) is 2788.1€ (2750€), meaning that an investor participating in all IPOs with a fixed investment of 5000€ would have received on average 56% of the subscribed shares. From *Kempower Oyj* IPO, an investor received shares worth only 183.7€, as the offering was significantly oversubscribed. In turn, an investor received a full subscription of shares from 24 IPOs (see Appendix 1).

Table 6. Underpricing (MAIR) by listing venue

	# of firms (n = 83)	MAIR, %
Main Market	25	5.10%
First North GM	58	8.23%
T-value	-	0.96
P-value	-	0.34

Source: author's calculations based on data from Appendix 1

By distinguishing the listing venues, table 5 shows that the average underpricing (MAIR) of First North GM IPOs is 8.23%, while the Main Market IPOs average underpricing (MAIR) is 5.10%. This is consistent with the assumption of firms with greater ex-ante uncertainty provide higher initial returns, as IPOs in the First North GM are usually more speculative regarding the true value of the offering. However, the p-value is 0.34, implying that the difference between average returns is not statistically significant.

Table 7. Market capitalization (MCAP) and underpricing (MAIR)

MCAP, (million)	# of firms (n = 83)	MAIR %
Small (MCAP ≤ 68)	42	5.49 %
Large (MCAP > 68)	41	9.16 %
T-statistic	-	0.90
P-value	-	0.37

Source: author's calculations based on data from Appendices 1 and 2

In table 7, firms are further classified into two categories according to their market capitalization to evaluate if company size influence on underpricing. The classification is executed by dividing the sample equally into two categories. Nasdaq Helsinki is a relatively small exchange compared to many other developed financial markets, and the market values of firms are relatively low. Large firm average underpricing (MAIR) of 9.16% is higher compared to small firm average underpricing (MAIR) of 5.49%. This is not in line with the assumption that higher ex-ante uncertainty would lead to higher initial returns. In turn, this indicates that investors in Finnish IPO market gain higher returns from Nevertheless, the p-value of 0.37 indicates that the difference between returns is not statistically significant.

Table 8. Offering size (SIZE) and underpricing (MAIR)

SIZE, (million)	# of firms (n = 83)	MAIR, %
Small (SIZE ≤ 14)	41	7.88 %
Large (SIZE > 14)	42	6.74 %
T-statistic	-	0.28
P-value	-	0.78

Source: author's calculations based on data from Appendices 1 and 2

Table 8 shows the average underpricing (MAIR) by the offering size. The offering size includes only primary shares issued. Small offering size average underpricing (MAIR) of 7.88% is slightly higher than large offering size average underpricing (MAIR) of 6.74%. Nevertheless, the difference between returns is statistically insignificant as the p-value is 0.78 (> 0.05).

Table 9. Firm age and underpricing (MAIR)

Firm age, (years)	# of firms (n = 83)	MAIR, %
Young (age ≤ 14)	43	10.27 %
Old (age > 14)	40	4.11 %
T-statistic	-	1.52
P-value	-	0.13

Source: author's calculations based on data from Appendices 1 and 2

Table 9 illustrates the underpricing among young and old firms. The division is executed so that the population would fall equally into both categories. Young companies result in underpricing (MAIR) of 10.27%, while old companies' average underpricing (MAIR) is 4.11%. The difference between underpricing (MAIR) of young and old firms is statistically insignificant as p-value is 0.13 (> 0.05).

Table 10. Mean age, offering size and underpricing (MAIR) by industry

Industry	# of firms (n = 83)	Mean age (years)	Offering size, (millions)	MAIR, %
Consumer goods and services	18 (21.7%)	20	23	5.65 %
Financials	9 (10.8%)	18	30	7.97 %
Health care	11 (13.3%)	21	24	-1.84 %
Industrials	24 (28.9%)	16	26	7.79 %
Real estate	4 (4.8%)	18	66	9.59 %
Technology	14 (16.9%)	21	21	16.22 %
Others	3 (0.22%)	12	15	0.22 %

Source: author's calculations based on data from Appendices 1 and 2

Table 10 shows the IPO division by industry and the corresponding average MAIR, firm age and offering size in millions. The table shows that IPOs have not been evenly distributed in all industry categories. Industrials represent the largest proportion of 28.9% of the sample. Industries with only one representative firm are classified as “others” which forms the smallest industry group, covering only 0.22% of the sample. Technology industry provided the highest average initial return of 16.22%, whereas health care industry provided the lowest average initial return of -1.84%. The highest average age of 21 years is among health care and technology companies. “Other” industries have the youngest average firm age of 12. Real estate firms have the highest average offering size of 66 million and other firms have the lowest average offering size of 15 million. Since some industries are underrepresented, the averages might appear high or low due to outliers.

3.2. IPO short-term performance

To evaluate the first-year performance of IPOs, WR values are calculated in accordance with the method presented in section 2.3.2.. In this thesis, WR values are calculated 1 month, 3 months, 6 months and 1 year after the initial offering. If WR is above 1, the IPO has outperformed the market index (OMXHPI). Correspondingly, if WR is below 1, the market index has outperformed the IPO. The sample size reduces at 3 months, 6 months, and 1 year periods since price data was not yet available on all IPOs held in 2021. To examine the magnitude of initial returns (MAIR), WR values are calculated separately by excluding and including the initial returns (MAIR). Additionally, short-run performance is evaluated by categorising firms by industry.

Table 11. Descriptive statistics of WR including the initial returns (MAIR) of IPOs taken place during 2013-2021

	1 month	3 months	6 months	1 year
Mean	1.080	1.081	1.119	1.141
Median	1.008	1.070	1.115	1.134
Standard deviation	0.290	0.262	0.358	0.525
Minimum	0.584	0.580	0.425	0.275
Maximum	2.580	1.816	2.362	2.898
T-value	2.509	2.750	2.734	2.023
P-value	0.007	0.007	0.008	0.048
n	83	79	68	57

Source: author's calculations based on data from Appendix 3

Table 11 shows descriptive statistics of WRs, including the initial returns (MAIR) of IPOs taken place in the Nasdaq Helsinki during 2013-2021. The data shows that the average WR is greater than 1 at each examined period. This implies that the IPOs have, on average, outperformed the benchmark index. One year after the IPO, the worst performer is *Herantis Pharma* Oyj, with the lowest WR value of 0.28, and the greatest performer is *Musti Group* Oyj, with the highest WR value of 2.90. Since the p-value for each examined period is less than 0.05, the null hypothesis $H_{0,2}$ (WR = 1) can be rejected, and the alternative hypothesis $H_{a,2}$ (WR ≠ 1) is assumed to be true.

Table 12. Descriptive statistics of WRs excluding the first day returns of IPOs during 2013-2021

	1 month	3 months	6 months	1 year
Mean	0.999	1.006	1.052	1.083
Median	0.984	0.992	1.033	1.028
Standard deviation	0.135	0.160	0.270	0.441
Minimum	0.684	0.712	0.425	0.263
Maximum	1.531	1.455	1.991	2.552
T-value	-0.097	0.342	1.585	1.416
P-value	0.923	0.733	0.118	0.162
n	83	79	68	57

Source: author's calculations based on data from Appendix 4

Table 12 presents the main descriptive statistics of WRs excluding the initial returns (MAIR) of IPOs during 2013-2021. 1 month average WR is slightly below 1, indicating that the market index (OMXHPI) has slightly outperformed IPOs. 3 months, 6 months and 1 year WR averages of 1.006, 1.052, and 1.083, respectively, are slightly above 1, indicating that IPOs have outperformed the market index. The average WR values at each period are lower compared to WRs including the initial returns. This implies that the initial returns cover a substantial proportion of the returns gained during different periods. Since p-value is greater than 0.05 at each period, it can be stated that the null hypothesis $H_{0,2}$ (WR = 1) cannot be rejected and is assumed to be true.

Table 13. WR values excluding initial returns categorised by industry

Industry	n	1 month	n	3 months	n	6 months	n	1 year
Consumer goods and services	20	1.01	20	1.06	18	1.16	15	1.11
Financials	8	0.96	9	0.95	9	0.99	8	0.98
Health care	11	1.03	10	0.96	8	0.90	5	0.93
Industrials	22	0.98	19	0.98	14	0.98	12	1.03
Real estate	4	1.00	4	1.05	4	1.27	3	1.53
Technology	15	1.00	14	0.98	10	1.06	9	1.15
Others	3	1.01	3	1.13	1	1.13	1	1.27

Source: author's calculations based on data from Appendices 2 and 4

Table 13 shows one year performance of IPOs grouped by industry. One year after the IPO, real estate industry has the greatest average WR value of 1.53, whereas the healthcare industry has the lowest average WR value of 0.93. Additionally, the financial industry average WR value is 0.98, indicating that it has slightly underperformed the market index one year after the IPO. Technology firms give the highest initial returns (see table 10) but one year later, real estate and 'other' firms have performed better. The sample size reduces significantly in 1month, 3 months, 6 months, and 1 year periods as price data is lacking for the year 2021 IPOs, so the results may be biased among some industries.

3.3. Multiple linear regression analysis

This section presents the multiple linear regression results. The purpose of the multiple regression model is to examine the effect of quarterly GDP growth rate (GDP), company market capitalization (MCAP), offering size (SIZE), industry (TECH), firm age (AGE), investment size (INV), and listing venue (LIST) on underpricing (MAIR).

Additionally, a correlation coefficient matrix is presented to examine individually the relationships between all variables, and to observe if multicollinearity occurs between the explanatory variables. Multicollinearity occurs if two or more explanatory variables experience a strong correlation. It reduces the reliability of a model and give the opportunity to make distorted conclusions. For

confirmation, variation inflation factors (VIFs) are calculated to determine if multicollinearity poses a problem. As a rule, if VIF < 2.5, there is no reason for concern about multicollinearity.

Table 14. Correlation coefficient matrix of examined variables

	MAIR	GDP	MCAP	SIZE	AGE	TECH	INV	LIST
MAIR	1							
GDP	0.211	1						
MCAP	0.068	0.107	1					
SIZE	0.093	0.040	**0.655**	1				
AGE	-0.142	-0.122	0.141	-0.030	1			
TECH	0.217	0.086	-0.179	-0.146	0.073	1		
INV	**-0.640**	-0.313	-0.143	-0.170	0.213	-0.186	1	
LIST	-0.081	-0.074	**0.510**	0.323	0.098	-0.226	0.124	1

Source: author's calculations based on data from Appendices 1 and 2

Table 14 presents a correlation coefficient matrix of all examined variables. The table indicates that investment size (SIZE) and underpricing (MAIR) are negatively associated with a correlation coefficient of -0.640. Furthermore, market capitalization (MCAP) and offering size (SIZE) have a positive correlation coefficient of 0.655, which is anticipated as larger firms' offering sizes are generally greater than offering sizes of small firms. Listing venue (LIST) and market capitalization (MCAP) are positively correlated by 0.510, indicating that firms listed on the Main Market have generally greater market capitalization than firms listed on the First North GM. Other variables experience low or non-existing correlations with each other.

Despite table 14 indicates a moderate correlation between independent variables (MCAP and SIZE & MCAP and LIST), a VIF test does not result in values higher than 2.5. Therefore, multicollinearity is not an issue in the model. Additionally, several modifications of the multiple regression model was applied to evaluate the effectiveness of the model, and the selection of variables was considered thoroughly. Therefore, the model is expected to provide reliable results by including all seven independent variables in it.

Table 15. Multiple linear regression coefficients and p-values

Variable	Coefficient	P-value
Intercept	0.295	0.399
GDP	0.075	0.913
MCAP (log)	-0.008	0.878
SIZE (log)	0.002	0.956
AGE (1+log)	-0.008	0.860
TECH (dummy)	0.052	0.260
INV	-0.000	**0.000**
LIST (dummy)	0.012	0.775
$R^2_{adjusted}$	0.367	-

Source: author's calculations based on data from Appendices 1 and 2

Table 15 presents the main features of the linear regression model. Log-transformation is executed if the data is highly skewed on the right (skewness >1). The adjusted R square of 0.367 implies independent variables explaining 36.7% of the variation in underpricing (MAIR). Furthermore, p-values describe the statistical significance of the relationship between quarterly GDP growth (GDP), market capitalization (MCAP), offering size (SIZE), firm age (AGE), industry (TECH), investment size (INV) and listing venue (LIST) (explanatory variables) and underpricing (MAIR) (a dependent variable). A p-value less than 0.05 indicates that the relationship between an explanatory variable and the dependent variable is statistically significant. Only the p-value of investment size (INV) (0.000) is less than 0.05, and thus, the relationship between investment size (INV) and underpricing (MAIR) is statistically significant.

3.4. Discussion of the results

Consistent with the preliminary assumption, GDP growth rate (GDP) and underpricing (MAIR) are positively associated with a low positive correlation of 0.211. This indicates that the GDP growth and MAIR move in the same direction to some extent. However, the strength of this relationship is statistically insignificant (p-value > 0.05). In Nasdaq Helsinki, IPOs are still relatively rare events, and therefore firm and offering specific characteristics might be more significant factors affecting underpricing than economic conditions.

Firms with large market capitalization experience higher underpricing in the Finnish IPO market than firms with a small market capitalization (see table 7). This is inconsistent with the assumption

of greater ex-ante uncertainty leading to higher initial returns. However, the finding is in consonance with signalling theories, suggesting that more established companies signal their bright prospects by underpricing the initial offering, and smaller firms cannot afford such action. In turn, table 5 and the multiple linear regression model show that listing venue (LIST) and underpricing (MAIR) are negatively correlated, indicating that the Main Market firms experience lower level of underpricing than the First North GM firms. This finding is consistent with the expectation of greater ex-ante uncertainty leading to higher initial returns since First North GM firms are considered to be smaller firms with higher risk. On table 7, firms are classified solely based on market capitalization, which explains the variation in results.

Usually, older companies are perceived as having a higher reputation and less uncertainty about the intrinsic value of the firm (Beatty and Ritter 1986). Ritter (1984) argues that older companies need to exercise less underpricing since there is no need to compensate investors for lacking information. In table 9, the sample is grouped by firm age, indicating that younger firms are underpriced on average by 10.27%, whereas old firms are underpriced on average by 4.11%. The ex-ante uncertainty theory could explain the variation of returns as the theory suggests that young firms experience higher initial returns than old companies. Table 14 shows a low negative correlation of -0.142 between firm age (AGE) and underpricing (MAIR). Nevertheless, according to the linear regression model, this relationship is not statistically significant.

In addition to company market capitalization (MCAP) and company age (AGE), offering size (SIZE) is used as a proxy to measure ex-ante uncertainty of the true value of the offering. Thus, a small offering size is expected to lead to high initial returns. Table 8 shows that small offerings provide slightly higher average excess return of 7.88% compared to large offerings' average initial return of 6.74%. In contrast, table 14 shows a low, though statistically insignificant, positive correlation of 0.094 between offering size (SIZE) and underpricing (MAIR). The inconsistency in results can be explained by the fact that in table 8, the sample is divided into only two categories according to firm age, and the outliers can affect the results significantly.

The relationship between investment size (INV) and underpricing (MAIR) is negative (see table 14), which is consistent with the preliminary assumption of an inverse relationship. Table 14 address a negative correlation of -0.64 between investment size (INV) and underpricing (MAIR), implying that oversubscribed IPOs experience more underpricing. This relationship is statistically significant and in consonance with Rock's (1986) Winner's curse hypothesis. Additionally, the

bandwagon hypothesis could explain this relationship since a higher subscription rate leads to higher returns.

Table 10 shows the level of underpricing varying by industry. Technology firms provided the highest MAIR of 16.22%, and therefore, the technology industry was chosen as an industry dummy for the linear regression analysis. Table 14 emphasise the expected positive relationship between industry dummy (TECH) and underpricing (MAIR). However, table 15 shows that the strength of this relationship is not statistically significant.

CONCLUSION

This thesis aimed to examine the short-term performance and underpricing of IPOs taken place in Nasdaq Helsinki during 2013-2021. This study was inspired by prior literature and globally high IPO activity in 2021. The final sample for the empirical study consists of 83 companies, including all primary listings in the Main Market and the First North GM in Finland during 2013-2021. All three research questions are answered and discussed below.

The existence of underpricing in the Finnish IPO market is evaluated by calculating raw initial returns (IRs) and market-adjusted returns (MAIRs). Additionally, wealth relative (WR) values are calculated 1 month, 3 months, 6 months and 1 year after the initial offering to assess the short-term performance of IPOs. The chosen market index is OMXHPI. Two hypotheses regarding MAIR and WR are stated to evaluate the statistical significance of the results. A multiple linear regression model is applied to assess the robustness of relationships between independent variables of quarterly GDP growth rate (GDP), company market capitalization (MCAP), offering size (SIZE), industry (TECH), firm age (AGE), investment size (INV), listing venue (LIST) and a dependent variable of underpricing (MAIR).

This study is in line with previous studies on IPO underpricing. According to the empirical study, the average (median) IR is 7.24% (2.75%), and the average (median) MAIR is 7.30% (3.11%), indicating that the IPOs are underpriced in the Finnish IPO market during 2013-2021. This result is lower compared to previous studies on Finnish IPOs. The variation in results can be explained by the different periods examined and firms' individual characteristics. Also, it can be stated that as the average initial return is lower than in previous studies, the market has been functioning more efficiently.

WR values are calculated by including and excluding the first trading day returns. WR values including initial returns imply that IPOs outperformed the market at every examined time period during the first year after initial offering. Additionally, WR values including initial returns differ statistically significantly from the hypothesised value of 1 at each examined period. In contrast,

WR values excluding initial returns imply that IPOs underperformed the market index 1 month after the initial offering. Surprisingly, 3 months, 6 months, and 1 year after the initial offering, IPOs slightly outperform the market index when initial returns were excluded. However, WR values excluding initial returns do not statistically significantly differ from the hypothesised value of 1 at any examined period.

The linear regression analysis results in only investment size (SIZE) and underpricing (MAIR) having a statistically significant (inverse) relationship. Investment size (SIZE) and underpricing (MAIR) have a moderate negative correlation of -0.655. This finding is in consonance with the Winner's curse hypothesis, as larger share allocations result in a lower level of underpricing (MAIR). In turn, quarterly GDP growth rate (GDP) does not result in a significant relationship with underpricing (MAIR). The lack of a statistically significant relationship between quarterly GDP rate and underpricing (MAIR) could be explained by the fact that IPOs are still relatively rare events in Finland, and the firm and offering specific characteristics might be more important determinants of underpricing than economic conditions.

First North GM firms experience higher initial returns (8.23%) than Main Market firms (5.10%), which is consistent with the assumption of ex-ante uncertainty being positively associated with underpricing. First North GM offerings are generally younger firms with more speculation regarding the true value of the offering, thus giving higher returns as a reward for investors taking a higher risk. Despite the returns between listing venues differ the finding is not statistically significant. Similarly, there is an inverse, though not statistically significant relationship, between firm age (AGE) and underpricing (MAIR). In turn, market capitalization (MCAP) and underpricing (MAIR) and offering size (SIZE) and underpricing (MAIR) result in having (insignificant) positive relationships. These findings are not consistent with the ex-ante uncertainty theory, but could be rather explained with signalling theories according to which larger and more "established" companies have the ability to signal their bright prospects by underpricing the offering.

Finnish IPO market activity is relatively low compared to many other developed stock markets. Therefore, the sample size consisted of only 83 firms pursuing an IPO during 2013-2021, and the sample size reduced significantly from 83 firms to 57 firms when one year returns were examined. Due to small sample size, it was difficult to find significant determinants for underpricing. Despite several regression models were tested for the empirical study before choosing the final set of

variables, the model could be even further developed and specified to find more significant determinants affecting underpricing. For further research, it would be interesting to observe longer-term returns when data of 2021 IPOs will be available. Additionally, it would be intriguing to investigate more comprehensively market conditions' impact on underpricing in the Finnish IPO market.

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APPENDICES

Appendix 1. Sample underpricing, listing venue, and investment size

Company	Date	List	IR, %	MAIR, %	INV
Taaleri Oyj	24.4.2013	First North	8.47 %	7.63 %	2081
Ovaro Kiinteistösijoitus Oyj	14.10.2013	Main	0.00 %	0.13 %	4996
NoHo Partners Oyj	28.11.2013	Main	8.04 %	7.96 %	4996
Verkkokauppa.com Oyj	4.4.2014	First North	3.22 %	3.11 %	3634
Herantis Pharma Oyj	11.6.2014	First North	0.86 %	1.34 %	4998
Loudspring Oyj	12.6.2014	First North	-12.31 %	-12.50 %	5000
Nexstim Oyj	14.11.2014	First North	-4.63 %	-4.00 %	4997
United Bankers Oyj	24.11.2014	First North	2.75 %	1.51 %	4983
Nixu Oyj	5.12.2014	First North	-5.23 %	-6.66 %	3120
Piippo Oyj	10.3.2015	First North	11.73 %	12.22 %	4995
Detection Technology Oyj	16.3.2015	First North	-2.50 %	-3.07 %	2756
Enento Group Oyj	27.3.2015	Main	-5.53 %	-4.88 %	4986
Robit Oyj	21.5.2015	First North	8.60 %	7.93 %	4999
Pihlajalinna Oyj	4.6.2015	Main	9.52 %	10.37 %	3413
Talenom Oyj	11.6.2015	First North	-12.20 %	-12.68 %	4997
FIT Biotech Oyj	1.7.2015	First North	-33.33 %	-34.43 %	5000
Kotipizza Group Oyj	7.7.2015	Main	4.00 %	5.97 %	5000
EAB Group Oyj	30.11.2015	First North	2.53 %	1.86 %	2750
Evli Pankki Oyj	2.12.2015	Main	24.00 %	23.40 %	959
Consti Yhtiöt Oyj	11.12.2015	Main	3.16 %	5.77 %	4427
Hoivatilat Oyj	31.3.2016	First North	15.00 %	16.47 %	3200
Lehto Group Oyj	28.4.2016	Main	-4.51 %	-4.98 %	1969
Tokmanni Group Oyj	3.5.2016	Main	0.00 %	0.97 %	4998
Skarta Group Oyj	15.6.2016	First North	-20.88 %	-21.87 %	4481
Vincit Group Oyj	17.10.2016	First North	41.70 %	41.84 %	634
Heeros Oyj	10.11.2016	First North	-9.68 %	-10.45 %	4997
DNA Oyj	30.11.2016	Main	-3.56 %	-4.04 %	3030
Next Games Oyj	23.3.2017	First North	18.14 %	17.46 %	924
Fondia Oyj	4.4.2017	First North	28.50 %	28.32 %	405
Kamux Oyj	16.5.2017	Main	0.42 %	0.26 %	4997

Company	Date	List	IR, %	MAIR, %	INV
Remedy Entertainment Oyj	29.5.2017	First North	18.41 %	18.61 %	599
Silmäasema Oyj	9.6.2017	Main	10.14 %	9.31 %	1152
Rovio Entertainment Oyj	29.9.2017	Main	0.00 %	-0.03 %	3071
Titanium Oyj	9.10.2017	First North	7.85 %	7.34 %	2374
Gofore Oyj	16.11.2017	First North	7.09 %	6.14 %	1670
Efecte Oyj	8.12.2017	First North	-6.00 %	-6.52 %	4197
Admicom Oyj	9.2.2018	First North	9.01 %	9.93 %	833
BBS-Bioactive Bone Substitutes Oyj	28.2.2018	First North	-29.30 %	-28.77 %	5000
Harvia Oyj	22.3.2018	Main	-0.38 %	1.13 %	5000
Anora Group Oyj	23.3.2018	Main	2.93 %	3.49 %	3570
Enersense International Oyj	24.4.2018	First North	-10.17 %	-9.59 %	4997
Kojamo Oyj	15.6.2018	Main	0.60 %	1.21 %	4998
Eezy Oyj	19.6.2018	First North	2.43 %	3.35 %	4380
Fellow Finance Oyj	10.10.2018	First North	2.20 %	4.08 %	1461
Rush Factory Oyj	16.11.2018	First North	0.00 %	-0,62 %	5000
Viafin Service Oyj	20.11.2018	First North	-5.83 %	-3.86 %	4998
Nordic ID Oyj	30.11.2018	First North	-14.63 %	-14.26 %	4995
Oma Säästöpankki Oyj	30.11.2018	Main	2.14 %	2.51 %	3717
LeadDesk Oyj	15.2.2019	First North	3.33 %	2.97 %	4463
Aallon Group Oyj	8.4.2019	First North	34.44 %	34.96 %	785
Relais Group Oyj	17.10.2019	First North	-0.68 %	-1.11 %	3397
Fodelia Oyj	26.11.2019	First North	18.64 %	18.59 %	456
Optomed Oyj	9.12.2019	Main	1.78 %	1.30 %	1310
Musti Group Oyj	13.2.2020	Main	15.02 %	15.27 %	2389
Bilot Oyj	17.3.2020	First North	-5.37 %	-6.69 %	670
Nanoform Finland Oyj	4.6.2020	First North	46.38 %	46.20 %	873
Kreate Group Oyj	19.2.2021	Main	30.37 %	30.27 %	287
Nightingale Health Oyj	19.3.2021	First North	-23.70 %	-23.68 %	3942
Sitowise Group Oyj	25.3.2021	Main	0.09 %	-0.15 %	1115
Orthex Group Oyj	25.3.2021	Main	8.72 %	8.49 %	423
Alexandria Pankkiiriliike Oyj	11.5.2021	First North	26.28 %	28.28 %	886
Netum Group Oyj	2.6.2021	First North	39.06 %	38.18 %	429
Merus Power Oyj	8.6.2021	First North	21.73 %	21.63 %	663
Toivo Group Oyj	11.6.2021	First North	21.29 %	20.56 %	2390
Solwers Oyj	18.6.2021	First North	11.33 %	12.18 %	578
Spinnova Oyj	24.6.2021	First North	24.84 %	23.84 %	441
Puuilo Oyj	24.6.2021	Main	10.00 %	9.00 %	1676
Purmo Group Oyj	29.6.2021	Main	0.40 %	-0.03 %	4160
Bioretec Oyj	28.9.2021	First North	-1.98 %	0.70 %	4998

Company	Date	List	IR, %	MAIR, %	INV
EcoUp Oyj	29.9.2021	First North	-7.01 %	-7.67 %	2192
Modulight Oyj	30.9.2021	First North	68.57 %	68.23 %	454
Inderes Oyj	11.10.2021	First North	75.76 %	76.06 %	500
Lifeline SPAC Oyj	15.10.2021	Main	5.16 %	4.68 %	1600
Fifax Oyj	25.10.2021	First North	-24.71 %	-24.47 %	4998
Lemonsoft Oyj	17.11.2021	First North	31.96 %	31.61 %	1418
Duell Oyj	24.11.2021	First North	17.44 %	17.59 %	1321
Norrhydro Group Oyj	1.12.2021	First North	31.27 %	29.13 %	274
Digital Workforce Services Oyj	3.12.2021	First North	-4.41 %	-3.34 %	1474
Lamor Corporation Oyj	8.12.2021	First North	0.00 %	0.03 %	613
Betolar Oyj	9.12.2021	First North	14.29 %	14.93 %	568
Aiforia Technologies Oyj	10.12.2021	First North	1.00 %	1.43 %	2029
Kempower Oyj	14.12.2021	First North	38.50 %	39.42 %	184
Administer Oyj	17.12.2021	First North	-1.26 %	-0.56 %	2722

Appendix 2. Sample market capitalization, offering size, age, and industry

Company	MCAP, (millions)	SIZE, (millions)	AGE	Industry
Taaleri Oyj	63	15	6	Financials
Ovaro Kiinteistösijoitus Oyj	49	31	3	Real estate
NoHo Partners Oyj	66	17	17	Consumer services
Verkkokauppa.com Oyj	173	19	22	Consumer services
Herantis Pharma Oyj	43	14	6	Health care
Loudspring Oyj	12	4	9	Industrials
Nexstim Oyj	45	15	14	Health care
United Bankers Oyj	50	10	28	Financials
Nixu Oyj	27	5	26	Technology
Piippo Oyj	8	2	73	Industrials
Detection Technology Oyj	67	18	24	Industrials
Enento Group Oyj	223	1	54	Financials
Robit Oyj	91	33	30	Industrials
Pihlajalinna Oyj	201	60	14	Health care
Talenom Oyj	50	12	43	Industrials
FIT Biotech Oyj	43	4	20	Health care
Kotipizza Group Oyj	32	26	28	Consumer services
EAB Group Oyj	49	5	11	Financials
Evli Pankki Oyj	157	14	30	Financials
Consti Yhtiöt Oyj	72	0.39	7	Industrials
Hoivatilat Oyj	66	17	8	Real estate
Lehto Group Oyj	297	61	8	Industrials
Tokmanni Group Oyj	394	96	27	Consumer services
Skarta Group Oyj	54	5	16	Industrials
Vincit Group Oyj	46	6	9	Technology
Heeros Oyj	14	3	16	Technology
DNA Oyj	1340	50	16	Telecommunications
Next Games Oyj	144	35	4	Consumer services
Fondia Oyj	30	3	13	Industrials
Kamux Oyj	288	21	14	Consumer services
Remedy Entertainment Oyj	64	13	22	Consumer services
Silmäasema Oyj	98	35	3	Health care
Rovio Entertainment Oyj	896	30	14	Consumer services
Titanium Oyj	55	5	8	Financials
Gofore Oyj	82	10	16	Technology

Company	MCAP, (millions)	SIZE, (millions)	AGE	Industry
Efecte Oyj	30	6	19	Technology
Admicom Oyj	47	5	14	Technology
BBS-Bioactive Bone Substitutes Oyj	28	4	15	Health care
Harvia Oyj	94	45	68	Consumer services
Anora Group Oyj	271	1	19	Consumer goods
Enersense International Oyj	122	16	13	Industrials
Kojamo Oyj	2101	150	49	Real estate
Eezy Oyj	74	35	30	Industrials
Fellow Finance Oyj	55	10	5	Financials
Rush Factory Oyj	9	2	3	Consumer services
Viafin Service Oyj	25	10	10	Consumer services
Nordic ID Oyj	11	3	9	Financials
Oma Säästöpankki Oyj	207	31	32	Technology
LeadDesk Oyj	34	6	10	Technology
Aallon Group Oyj	23	5	1	Industrials
Relais Group Oyj	120	20	9	Consumer services
Fodelia Oyj	30	5	1	Consumer goods
Optomed Oyj	60	20	16	Health care
Musti Group Oyj	293	45	32	Consumer services
Bilot Oyj	25	8	15	Technology
Nanoform Finland Oyj	230	70	12	Health care
Kreate Group Oyj	73	13	7	Industrials
Nightingale Health Oyj	425	110	8	Health care
Sitowise Group Oyj	288	10	45	Industrials
Orthex Group Oyj	121	75	65	Consumer services
Alexandria Pankkiiriliike Oyj	65	4	25	Financials
Netum Group Oyj	37	8	21	Technology
Merus Power Oyj	43	12	13	Industrials
Toivo Group Oyj	111	13	6	Real estate
Solwers Oyj	64	9	4	Industrials
Spinnova Oyj	390	30	39	Consumer services
Puuilo Oyj	560	115	7	Industrials
Purmo Group Oyj	108	108	3	Industrials
Bioretec Oyj	42	2	23	Health care
EcoUp Oyj	67	15	42	Industrials
Modulight Oyj	277	72	21	Technology
Inderes Oyj	41	6	12	Technology
Lifeline SPAC Oyj	125	100	1	Others
Fifax Oyj	66	15	9	Consumer goods

Company	MCAP, (millions)	SIZE, (millions)	AGE	Industry
Lemonsoft Oyj	216	15	15	Technology
Duell Oyj	131	20	3	Consumer services
Norrhydro Group Oyj	34	8	36	Industrials
Digital Workforce Services Oyj	73	23	6	Technology
Lamor Corporation Oyj	130	35	39	Utilities
Betolar Oyj	105	35	5	Industrials
Aiforia Technologies Oyj	130	30	8	Health care
Kempower Oyj	319	100	4	Industrials
Administer Oyj	69	14	36	Industrials

Appendix 3. WR values including first trading day return

Company	1 month	3 months	6 months	1 year
Taaleri Oyj	1.20	1.29	1.13	1.54
Ovaro Kiinteistösijoitus Oyj	0.94	0.93	1.21	1.25
NoHo Partners Oyj	1.00	1.00	0.87	0.72
Verkkokauppa.com Oyj	1.00	1.04	1.32	1.07
Herantis Pharma Oyj	0.99	0.89	0.61	0.27
Loudspring Oyj	0.64	0.58	0.55	0.64
Nexstim Oyj	0.94	0.68	0.77	0.88
United Bankers Oyj	1.01	0.98	1.23	1.19
Nixu Oyj	0.95	0.92	0.97	0.89
Piippo Oyj	0.99	0.98	0.87	0.81
Detection Technology Oyj	0.96	1.10	1.14	1.33
Enento Group Oyj	0.94	0.98	1.03	1.03
Robit Oyj	1.11	1.10	1.03	1.13
Pihlajalinna Oyj	1.24	1.38	1.65	1.75
Talenom Oyj	0.83	0.81	0.74	0.75
FIT Biotech Oyj	0.64	0.61	0.51	0.50
Kotipizza Group Oyj	0.93	1.02	1.22	1.61
EAB Group Oyj	0.96	0.87	0.84	0.76
Evli Pankki Oyj	1.23	1.15	1.09	1.06
Consti Yhtiöt Oyj	1.01	1.19	1.27	1.52
Hoivatilat Oyj	1.17	1.21	1.85	2.08
Lehto Group Oyj	1.00	1.05	1.35	1.55
Tokmanni Group Oyj	1.00	0.92	1.24	1.20
Skarta Group Oyj	0.63	0.64	0.59	0.58
Vincit Group Oyj	1.51	1.42	1.50	1.43
Heeros Oyj	0.79	0.97	0.87	0.64
DNA Oyj	0.91	1.03	1.09	1.23
Next Games Oyj	0.98	0.91	1.48	0.83
Fondia Oyj	1.28	1.23	1.43	1.54
Kamux Oyj	1.00	1.07	0.93	0.81
Remedy Entertainment Oyj	1.11	1.17	1.19	1.22
Silmäasema Oyj	1.19	1.25	1.04	0.74
Rovio Entertainment Oyj	0.99	0.80	0.42	0.38
Titanium Oyj	1.01	1.03	1.19	1.19
Gofore Oyj	1.10	1.26	1.24	1.40
Efecte Oyj	0.97	0.92	0.94	0.90
Admicom Oyj	1.06	1.37	1.73	2.76
BBS-Bioactive Bone Substitutes Oyj	0.76	0.62	0.60	0.60
Harvia Oyj	0.99	1.18	1.14	1.28

Company	1 month	3 months	6 months	1 year
Anora Group Oyj	1.15	1.13	0.95	0.99
Enersense International Oyj	0.86	0.85	0.70	0.37
Kojamo Oyj	1.10	1.13	1.19	1.70
Eezy Oyj	1.04	1.08	0.80	0.99
Fellow Finance Oyj	1.05	1.02	1.02	0.49
Rush Factory Oyj	0.79	0.96	0.96	0.80
Viafin Service Oyj	0.85	0.86	1.01	0.93
Nordic ID Oyj	0.58	0.66	0.77	0.49
Oma Säästöpankki Oyj	1.00	1.02	1.03	1.20
LeadDesk Oyj	1.05	1.23	1.37	1.62
Aallon Group Oyj	1.38	1.34	1.47	1.74
Relais Group Oyj	1.06	1.11	1.06	1.20
Fodelia Oyj	1.34	1.66	2.36	1.72
Optomed Oyj	1.29	1.09	1.19	1.37
Musti Group Oyj	1.42	1.64	1.96	2.90
Bilot Oyj	0.89	0.79	0.67	0.70
Nanoform Finland Oyj	1.26	1.22	1.10	1.56
Kreate Group Oyj	1.23	1.22	1.16	1.20
Nightingale Health Oyj	0.76	0.70	0.51	-
Sitowise Group Oyj	1.07	0.96	0.88	-
Orthex Group Oyj	1.29	1.26	1.50	-
Alexandria Pankkiiriliike Oyj	1.08	1.05	1.22	-
Netum Group Oyj	1.31	1.23	1.33	-
Merus Power Oyj	1.71	1.52	1.40	-
Toivo Group Oyj	1.16	1.35	1.29	-
Solwers Oyj	0.93	0.94	1.05	-
Spinnova Oyj	1.58	1.82	1.65	-
Puuilo Oyj	1.12	1.13	1.30	-
Purmo Group Oyj	0.95	1.19	1.30	-
Bioretec Oyj	0.90	0.94	-	-
EcoUp Oyj	0.84	0.81	-	-
Modulight Oyj	2.58	1.68	-	-
Inderes Oyj	1.61	1.44	-	-
Lifeline SPAC Oyj	1.22	1.23	-	-
Fifax Oyj	0.59	0.59	-	-
Lemonsoft Oyj	1.39	1.27	-	-
Duell Oyj	1.38	1.46	-	-
Norrhydro Group Oyj	1.29	1.33	-	-
Digital Workforce Services Oyj	0.92	0.78	-	-
Lamor Corporation Oyj	0.92	1.15	-	-
Betolar Oyj	1.06	-	-	-
Aiforia Technologies Oyj	1.06	-	-	-
Kempower Oyj	1.78	-	-	-
Administer Oyj	0.80	-	-	-

Appendix 4. WR values excluding first trading day return

Company	1 month	3 months	6 months	1 year
Taaleri Oyj	1.10	1.19	1.04	1.42
Ovaro Kiinteistösijoitus Oyj	0.94	0.93	1.21	1.11
NoHo Partners Oyj	0.93	0.93	0.81	0.67
Verkkokauppa.com Oyj	0.97	1.01	1.28	1.03
Herantis Pharma Oyj	0.98	0.88	0.61	0.26
Loudspring Oyj	0.80	0.73	0.69	0.80
Nexstim Oyj	0.98	0.72	0.81	0.92
United Bankers Oyj	0.98	0.96	1.19	1.16
Nixu Oyj	1.01	0.97	1.03	0.94
Piippo Oyj	0.89	0.87	0.78	0.72
Detection Technology Oyj	0.99	1.12	1.17	1.37
Enento Group Oyj	1.00	1.04	1.09	1.09
Robit Oyj	1.02	1.01	0.95	1.04
Pihlajalinna Oyj	1.13	1.26	1.50	1.60
Talenom Oyj	0.94	0.92	0.84	0.85
FIT Biotech Oyj	0.96	0.92	0.77	0.75
Kotipizza Group Oyj	0.90	0.98	1.17	1.55
EAB Group Oyj	0.94	0.85	0.82	0.74
Evli Pankki Oyj	1.00	0.93	0.88	0.85
Consti Yhtiöt Oyj	0.97	1.15	1.23	1.47
Hoivatilat Oyj	1.02	1.05	1.61	1.81
Lehto Group Oyj	1.05	1.10	1.41	1.63
Tokmanni Group Oyj	1.00	0.92	1.24	1.20
Skarta Group Oyj	0.80	0.81	0.74	0.73
Vincit Group Oyj	1.07	1.00	1.06	1.01
Heeros Oyj	0.87	1.07	0.97	0.71
DNA Oyj	0.95	1.07	1.13	1.27
Next Games Oyj	0.84	0.78	1.26	0.71
Fondia Oyj	1.00	0.96	1.12	1.20
Kamux Oyj	0.99	1.07	0.93	0.81
Remedy Entertainment Oyj	0.94	0.99	1.00	1.03
Silmäasema Oyj	1.08	1.13	0.94	0.67
Rovio Entertainment Oyj	0.99	0.80	0.42	0.38
Titanium Oyj	0.93	0.95	1.10	1.10
Gofore Oyj	1.03	1.17	1.16	1.31
Efecte Oyj	1.04	0.97	1.00	0.96
Admicom Oyj	0.98	1.27	1.60	2.55
BBS-Bioactive Bone Substitutes Oyj	1.07	0.87	0.85	0.84

Company	1 month	3 months	6 months	1 year
Harvia Oyj	0.99	1.19	1.14	1.29
Anora Group Oyj	1.12	1.10	0.92	0.97
Enersense International Oyj	0.96	0.95	0.78	0.41
Kojamo Oyj	1.10	1.12	1.18	1.69
Eezy Oyj	1.01	1.06	0.78	0.96
Fellow Finance Oyj	1.02	1.00	1.00	0.48
Rush Factory Oyj	0.79	0.96	0.96	0.80
Viafin Service Oyj	0.91	0.92	1.07	0.99
Nordic ID Oyj	0.68	0.78	0.90	0.57
Oma Säästöpankki Oyj	0.98	1.00	1.01	1.17
LeadDesk Oyj	1.02	1.19	1.33	1.57
Aallon Group Oyj	1.03	1.00	1.09	1.29
Relais Group Oyj	1.07	1.12	1.07	1.21
Fodelia Oyj	1.13	1.40	1.99	1.45
Optomed Oyj	1.27	1.07	1.17	1.35
Musti Group Oyj	1.23	1.43	1.70	2.52
Bilot Oyj	0.94	0.83	0.71	0.74
Nanoform Finland Oyj	0.86	0.84	0.75	1.07
Kreate Group Oyj	0.95	0.94	0.89	0.92
Nightingale Health Oyj	1.00	0.92	0.67	-
Sitowise Group Oyj	1.07	0.96	0.88	-
Orthex Group Oyj	1.18	1.16	1.38	-
Alexandria Pankkiiriliike Oyj	0.73	0.71	0.83	-
Netum Group Oyj	0.94	0.89	0.95	-
Merus Power Oyj	1.40	1.25	1.15	-
Toivo Group Oyj	0.96	1.11	1.07	-
Solwers Oyj	0.83	0.85	0.94	-
Spinnova Oyj	1.26	1.45	1.32	-
Puuilo Oyj	1.02	1.03	1.18	-
Purmo Group Oyj	0.95	1.18	1,29	-
Bioretec Oyj	0.91	0.96	-	-
EcoUp Oyj	0.90	0.83	-	-
Modulight Oyj	1.53	1.00	-	-
Inderes Oyj	0.92	0.82	-	-
Lifeline SPAC Oyj	1.16	1.17	-	-
Fifax Oyj	0.79	0.79	-	-
Lemonsoft Oyj	1.05	0.96	-	-
Duell Oyj	1.17	1.25	-	-
Norrhydro Group Oyj	0.98	1.01	-	-
Digital Workforce Services Oyj	0.96	0.81	-	-
Lamor Corporation Oyj	0.92	1.15	-	-
Betolar Oyj	0.92	-	-	-

Company	1 month	3 months	6 months	1 year
Aiforia Technologies Oyj	1.05	-	-	-
Kempower Oyj	1.29	-	-	-
Administer Oyj	0.84	-	-	-

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