TALLINN UNIVERSITY OF TECHNOLOGY

School of Business and Governance

Department of Economics and Finance

Max Yair Jonathan Leinson

IPO UNDERPRICING AND SHORT-TERM PERFORMANCE IN NASDAQ BALTIC 2004-2023

Bachelor's thesis

Programme International Business Administration, specialization Finance

Supervisor: Pavlo Illashenko, PhD

Tallinn 2024

I hereby declare that I have compiled the thesis independently

and all works, important standpoints and data by other authors

have been properly referenced and the same paper

has not been previously presented for grading.

The document length is 8 520 words from the introduction to the end of the conclusion.

 Max Yair Jonathan Leinson 09.05.2024

(date)

Table of Contents

ABSTRACT

The aim of this thesis is to investigate initial public offering (IPO) underpricing and short-term performance in the Baltic region between 2004 and 2023. The sample includes 36 firms that were listed on the Nasdaq Baltic Main list and the Nasdaq Baltic First North Alternative list during that time. The theoretical framework provides insight into IPOs, IPO underpricing, and the theories that underpin underpricing. The theoretical framework also includes information regarding Nasdaq Baltic and the IPO process in the Baltic region. Because of the nature of this investigation, a quantitative method was adopted. Underpricing is determined by calculating market-adjusted raw initial returns. To analyse short-term performance, wealth relative values are determined over various time intervals. This study also presents a linear regression model to examine the link between company-specific and market-specific independent variables and the dependent variable of underpricing. Between 2004 and 2023, the Baltic region had an average market-adjusted return of 10.56%. On average, IPOs outperformed the market when first trading day returns were included, and vice versa when first trading day returns were excluded. Linear regression results showed that the macrovariable gross domestic product growth rate had a strong connection with underpricing.

Keywords: Initial public offering, short-term performance, regression

INTRODUCTION

An initial public offering (IPO) is the event where a privately owned company makes its shares available to the public for the first time (Ritter 1998). During an initial public offering (IPO), a company becomes publicly traded, allowing its shares to be bought and sold on a stock exchange. The primary reason for a company to go public is usually to obtain external equity capital to fund future developments and operations (Ritter, 1998; Loughran & Ritter, 2004).

Many studies on initial public offerings (IPOs) have been undertaken over the past few decades, who have found evidence of IPO underpricing in many regions and exanimated different factors and their relationship with underpricing. There is not much research done about IPOs in Baltic region and this thesis aims to contribute to the research about IPOs in emerging markets more specifically the Baltics by analyzing the short-term performance and underpricing of initial public offerings (IPOs) on Nasdaq Baltic from 2004 to 2023. The underpricing of IPOs can be determined by considering the market-adjusted raw initial returns. The first-year performance of the IPO is evaluated by calculating the wealth relative values at 1 month, 3 months, 6 months, and 12 months after the IPO. A linear regression model is also used to examine the impact of the annual gross domestic product growth rate, 12-month sales revenue prior to the initial public offering (IPO), IPO proceeds, industry, firm age, 90-day market performance prior to the IPO, and listing venue on underpricing.

To achieve the objective of this study, we shall address the following three research questions:

1. Is there evidence of underpricing in IPOs listed on Nasdaq Baltic between 2004 and 2023?
2. Are initial public offerings (IPOs) outperforming or underperforming the benchmark index in the first year after going public?
3. What is the impact of firm-specific qualities and market conditions on the extent of underpricing?

The thesis is organized in the following manner: The paper is divided into three primary chapters: theoretical framework and background, data and methodology, and empirical study. The theoretical framework and background presents a comprehensive analysis of IPOs and the phenomenon of IPO underpricing. It then delves into several theories that explain the reasons behind underpricing. In addition, this chapter presents previous research discoveries and a thorough examination of Nasdaq Baltic and the initial public offering (IPO) process in the Baltic region. In the second chapter, the data and sample are presented, together with the definitions of the variables used for the regression analysis. In addition, the study includes a presentation of the computations and statistical methods used for the empirical analysis. Empirical study part is divided to descriptive statistics, short-term performance, linear regression and discussion. The conclusion provides a concise overview of the primary discoveries and offers practical implications for future research.

1. THEORETICAL FRAMEWORK AND BACKGROUND

This chapter presents a broad overview of initial public offerings (IPOs). This study provides a comprehensive analysis of IPO underpricing and short-term performance by assessing prior literature on the topic. Furthermore, this chapter investigates the Nasdaq Baltic marketplace and its IPO process. The study is based on an examination of previous studies and literature on underpricing and short-term performance, guaranteeing a comprehensive understanding of these elements of IPOs.

1.1. Introduction to IPOs

An initial public offering (IPO) is an event signifying the shift from being a privately owned company to being a publicly traded company listed on a stock exchange. An IPO is the process of selling shares to the public for the first time. An IPO can have a significant impact on a company's financial structure, governance, and future trajectory. IPOs play a crucial role in financial markets by providing companies with a way to collect additional funding to drive development, innovation, and expansion.

1.1.1. Definition and Significance

Unlike private financing rounds that have restrictions on participation for only certified investors or venture capital companies, IPOs provide an opportunity for a wide range of investors to take part in the company's growth trajectory. The democratization of investment options is a defining characteristic of public capital markets and highlights the economic importance of IPOs.

The choice to go public is usually impacted by several factors. These factors could include the need for additional capital to help fund the company's expansion goals, wanting to offer a way for existing stakeholders to sell their shares, and the goal of establishing a market valuation that precisely reflects the company's worth. In addition, being listed on a stock exchange enhances a

company's visibility, credibility, and brand awareness, hence opening opportunities for fresh ventures and partnerships (Ritter, 1998; Loughran & Ritter, 2004).

1.1.2. Challenges and Considerations

Although there are benefits, the choice to become a publicly traded company is not without its difficulties. Companies must consider the costs linked to regulatory compliance, the possibility of market instability, and quarterly reporting demands. The selection of the appropriate time, accurate valuation, and right underwriters are pivotal elements that can significantly impact the outcome of an initial public offering.

IPOs are crucial in the financial markets as they allow companies to obtain public funding, which in turn facilitates their expansion and progress. Although the process is complicated and requires a lot of preparation and careful thought, the potential advantages of becoming a publicly traded company make it a key strategic achievement for many companies.

1.2. IPO Underpricing

The IPO process is a milestone in a company's existence, signifying its shift from being privately owned to becoming publicly owned. An interesting element of this process, thoroughly recorded in markets worldwide, is the IPO underpricing. Underpricing is the phenomenon where the IPO is priced below its closing price on the first day of trading. Ljungqvist (2007) defines underpricing as the percentage difference between the original offering price of IPO shares and the closing price at the end of the first trading day.

The decision to put an IPO's offer price below its market value is based on multiple factors. Jenkinson et al. (2001) emphasize the need to set an offer price that is appealing enough to get enough equity funding. Investors who participate in the IPO profit from this purposeful underpricing since they often receive a significant return on the first day of trading.

This chapter explores the phenomenon of underpricing within the context of three theoretical frameworks: signaling theories, the bandwagon hypothesis, and the winner's curse theory.

1.2.1 Winner's Curse Theory

The Winner's Curse theory, developed by Rock (1986), explains the reason behind the phenomenon of underpricing IPOs in financial markets. Rock's study classified individuals in the market into two categories based on their informational advantage concerning the actual worth of an IPO: those who possess knowledge and those who lack it (Rock, 1986). Well-informed investors, who have broad knowledge about the true worth of IPOs, carefully select which IPOs to participate in. They specifically choose IPOs that are believed to be underpriced, since this increases the likelihood of making a profit. Uninformed investors, who lack this specific knowledge, often participate in IPOs without considering the pricing, which directly affects the way IPO subscriptions work.

This behavioral differentiation gives rise to a market phenomenon where undervalued IPOs generate greater interest, leading to an oversubscription. As a result of this excessive demand, not all investors are able to obtain the desired number of shares, which primarily advantages knowledgeable investors who are more capable of recognizing and investing in these profitable, undervalued opportunities. If an IPO is priced too high, it reduces the interest from knowledgeable investors. As a result, uneducated investors are more likely to obtain more shares. This can be disadvantageous for them because of the inflated offering prices (Rock, 1986).

Unequal allocation of investment results leads to an "adverse selection" predicament where uneducated investors, who suffer the most from overvalued IPOs, may exit the market. This situation poses a risk to the market's inclusiveness and efficiency, leading underwriters to deliberately underprice IPOs. This method seeks to ease the possible losses experienced by investors who lack information, promoting their ongoing involvement in the market and maintaining an equilibrium between informed and ignorant investor participation (Rock, 1986).

There are several empirical validations of Rock's Winner's Curse theory. Levis (1990) conducted a study on the UK market and provided evidence that supports the hypothesis. The study showed that uneducated investors tend to acquire shares from overpriced IPOs and face difficulties in achieving high profits from underpriced offerings that are in high demand. In a similar manner, Keloharju (1993) observed that uneducated investors in the Finnish market tended to acquire a larger percentage of shares from overvalued initial IPOs and a smaller percentage from those that showed favorable early returns. Expanding on Rock's idea, Beatty and Ritter (1986) investigated

the relationship between IPO underpricing and ex-ante uncertainty. They argued that a greater level of underpricing serves as compensation for the greater uncertainty and information asymmetry associated with determining the fair market value of the IPO.

1.2.2 Signaling theory

Signaling theory provides an understanding of how underpricing can function as a strategic instrument for corporations. The theory is based on Ibbotson's research in 1975 and suggests that underpricing creates a positive impression on investors, leading them to be willing to pay higher prices for future issues. Over time, the theory has developed to include more sophisticated perspectives on market dynamics and the unequal distribution of knowledge (Ibbotson, 1975).

Allen and Faulhaber (1989) contributed by suggesting that underpricing acts as a signal to the market regarding a company's quality and its prospects. Based on their theory, a company that possesses greater knowledge about its future performance may intentionally set a lower price for its IPO. This decision demonstrates the company's belief in its future success and its capacity to recoup the losses caused by underpricing through future stock issues. However, this approach is mainly suitable for reputable companies that have the financial capacity to bear the short-term financial loss resulting from lower offering prices than the market value. However, "low-quality" companies may face difficulties in recovering from losses caused by underpricing, particularly if their actual worth is exposed before they can raise more capital (Allen and Faulhaber 1989).

Grinblatt and Hwang (1989) and Welch (1989) provided more evidence in support of the signaling theory. They emphasized that underpricing could discourage "low-quality" companies from imitating high-quality companies since it could put financial strain on them. According to Welch (1989), low-quality companies may find it extremely expensive to try to seem "high-quality." This creates a self-regulating mechanism that maintains the credibility of the signal given by underpricing.

The empirical evidence from Álvarez and Gonzáles (2005) about the Spanish IPO market and Cornanic and Novak (2015) research on Polish IPOs provides support for the signaling theory. These studies showed a positive correlation between underpricing and the performance of succeeding seasoned equity offerings (SEOs). The findings indicated that underpricing might

effectively support the raising of extra equity capital, especially in markets with significant information asymmetry.

Ritter (2011) conducted an evaluation of the signaling theories, contending that "high-quality" companies had more effective methods of communicating their worth to investors. Ritter (2011) highlighted the limitations of the signaling theory, explaining its limited emphasis on the information asymmetry between IPO issuers and investors while disregarding other types of information asymmetry, such as informed and uninformed investors, investors and underwriters, and issuing firms and underwriters.

The findings of Spiess and Pettway (1997), Garfinkel (1993), and Kennedy et al. (2006) challenges the implications of signaling theories. Their empirical research demonstrated that a significant degree of underpricing does not always result in successful SEOs. These studies challenged the effectiveness of underpricing as a means of signaling, indicating that the connection between underpricing and future financial success is more complex than originally thought.

Essentially, the signaling theories provide a convincing explanation for the phenomenon of IPO underpricing. It suggests that underpricing serves as a deliberate indication of a company's high quality and promising prospects. Empirical evidence confirms the fundamental principles of the theory, but critical assessments and conflicting findings emphasize the intricate nature of underpricing dynamics.

1.2.3 The Bandwagon Hypothesis

The Bandwagon Hypothesis, by Welch (1992), refers to a behavioral phenomenon in IPO markets where the behaviors of early investors have an impact on the behavior of secondary investors. This phenomenon demonstrates that when initial investors show interest in an IPO, it can generate a force that motivates others to also invest without considering their own individual assessments or knowledge. If there is not enough initial interest, it can discourage potential investors. This shows that judgments are influenced by the perceived wisdom of the group rather than individual judgment (Welch, 1992).

Issuers and investment banks strategically underprice IPOs to attract early investors, as analyzed by Ritter (1998). Underpricing functions as a motivation, utilizing social and psychological factors

to increase demand and guarantee the success of the offering by addressing the concerns of potential investors. This method highlights the significance of involving investors early on to provide a favorable example for the IPO. It essentially utilizes underpricing as a trigger for high interest, ensuring the overall success of the IPO (Ritter, 1998).

1.3. Nasdaq Baltics

The Nasdaq Baltic is a part of the extensive Nasdaq, Inc. and Nasdaq Nordics network. It serves as the main securities market in Estonia, Latvia, and Lithuania, providing a platform for listing, trading, and sharing market data, along with other important financial services. It includes different market categories, such as the primary and secondary markets, to meet the diverse needs of entities at different stages of their growth and development. The Nasdaq Baltic offers three main sectors for enterprises seeking to enter the capital markets: the Main market, the secondary market, and the First North alternative market (Baltic MTF) (Nasdaq Baltic, 2019).

The Main market is for established companies that must meet strict regulatory and disclosure standards. Equally, the First North Growth Market provides a more adaptable option for up-and-coming companies with looser regulations while still benefiting from the backing and reputation of the Nasdaq system. This study primarily examines the differences between the Main Market and the First North Alternative Market of Nasdaq Baltic. It emphasizes their role in supporting companies to access capital and supporting their growth at different stages. The study does not cover the secondary market listings (Nasdaq Baltic, 2019).

Between 2004 and 2023, there were a total of 49 IPOs on the Nasdaq Baltic. The IPOs were not equally distributed across the years or among the countries within the Baltic region. Estonia had 27 IPOs, making up almost 55% of the total. Lithuania had 13 IPOs, accounting for approximately 27%, while Latvia had 9 IPOs, representing 18%. In 2009 and 2011, IPOs were not recorded. During the period, there were an average of 2,45 IPOs per year. In the given timeframe, the year 2021 was exceptionally notable due to its high level of activity, characterized by a record-breaking nine IPOs.

1.3.1 Nasdaq Baltic IPO process

IPO is a strategic move for companies aiming to go to the public markets for external capital. Like other markets, the IPO process in the Baltic region involves careful planning and devotion to regulatory requirements, as outlined in the Nasdaq Baltic market guidelines.

The first phase lays the groundwork for the IPO, where companies align their financial reporting with the International Financial Reporting Standards (IFRS) or the Generally Accepted Accounting Principles (GAAP), as mandated by Nasdaq Baltic's regulatory framework. Thorough due diligence is conducted to assess the business's risks and opportunities, ensuring a strong evaluation of its operational and financial health. This stage also involves hiring an underwriter and advisors, who play a crucial role in navigating the IPO process, from structuring the offer to pricing and market positioning (Nasdaq Baltic, 2015).

As the company transitions to the second stage, the focus shifts to finalizing the IPO terms and obeying the regulatory guidelines set forth by the Nasdaq Baltic and the Financial Supervisory Authority. The preparation of a comprehensive prospectus is, detailing the company's financial performance, risks, and strategic outlook. This document undergoes a thorough inquiry and must be approved by the appropriate regulatory body before the company can publicly announce its intent to go public. This disclosure enables potential investors and analysts to conduct an informed evaluation of the company (Nasdaq Baltic, 2015).

The culmination of the IPO process sees the company offering shares to both institutional and private investors, culminating in the allocation and declaration of share distribution. Transparency is vital, with the company obligated to provide detailed financial statements and operational disclosures to the public. The announcement of the IPO's outcome by the exchange precedes the commencement of trading, marking the transition of the company into a publicly traded entity. The timeline for an IPO on the Nasdaq Baltic Main Market typically spans 6 to 12 months, reflecting the thoroughness required in meeting the exchange's listing criteria (Nasdaq Baltic, 2015).

The decision to pursue an IPO involves significant financial implications, both direct costs (such as legal, auditing, and underwriting fees) and indirect costs associated with the opportunity cost of management's time and the potential underpricing of the initial share offering. Post-IPO,

companies continue to incur costs related to compliance and ongoing disclosure to maintain their listed status on the exchange (Nasdaq Baltic, 2015).

To conclude, the IPO process on the Nasdaq Baltic mirrors the structured and regulatory-driven approach observed in other markets, underscoring the complexities and strategic planning required to successfully navigate public market entry. This pathway not only enables companies to secure the necessary capital for growth but also enhances their visibility and credibility within the broader financial ecosystem.

2. Data and Methodology

This part of the thesis presents the data samples and methods used in this study. It uses similar methods to other studies and takes a quantitative approach. This study investigates how IPOs performed in their first year on the Nasdaq Baltic from 2004 to 2023. It also investigates how the characteristics of the companies and their offerings, along with market conditions, affect the underpricing.

2.1. Data Collection

This thesis includes 36 companies listed in the Nasdaq Baltic Main List and First North Baltic Share List from 2004 to 2023.

The data regarding the issuance prices of shares and the dates of IPOs are obtained from company prospectuses, annual reports, websites, press announcements, and the Nasdaq Baltic database. To assess the short-term performance of IPOs, the closing prices of companies are recorded at several intervals: 1 day, 1 month, 3 months, 6 months, and 1 year following the first offering. The OMX Baltic Pricing Index (OMXBBPI) serves as a benchmark for evaluating market performance over the analyzed period. OMXBBPI comprises all the shares that are listed on the Nasdaq Baltic stock exchange, excluding dividends. The closing prices of shares and OMXBBPI are obtained from the Nasdaq Baltic database.

2.2. Regression variables

A multiple linear regression model is used to examine how the annual GDP growth rate (GDP), sales revenue 12 months prior to the IPO (SALES), IPO Proceeds (PROCEEDS), industry (TECH), firm age (AGE), listing venue (LIST), and 90-day market returns prior to the IPO (MARKET) affect underpricing (MARI).

To examine the economic factors in the Baltic nations, the annual gross domestic product growth rates (GDP) for Estonia, Latvia, and Lithuania from 2004 to 2023 were gathered. The data was obtained from the free statistical database of the World Bank. Considering that IPOs are impacted by macroeconomic factors, it is essential to examine the GDP growth rates in relation to IPO activities in these nations. This study attempts to investigate if comparable patterns of higher underpricing (MARI) during expansionary economic phases, as observed in prior research such as Choe et al. (1993), may be found in the Baltic region. In addition, La Porta et al. (1997) established a direct relationship between macroeconomic factors, such as GDP growth, and IPO activity. This implies that economic expansion might create a favorable climate for IPOs by boosting investor confidence and market optimism.

The data about IPO proceeds (PROCEEDS) is gathered from company prospectuses, which disclose the results of the IPO, including the gross proceeds from the IPO. These proceeds indicate the total amount of capital raised by a company. In the literature, the size of an offering is considered as a proxy for ex-ante uncertainty (Beatty, Ritter, 1986; Carter et al., 1998). According to previous studies smaller offerings, which involve greater risk, are expected to generate higher returns compared to larger offerings. This implies that there is an inverse correlation between the proceeds from an IPO and the degree of underpricing (MARI), which can be explained by the concept of ex-ante uncertainty.

The company age (AGE) is calculated by subtracting the founding year from the IPO year. Company age is used to evaluate the level of uncertainty about the company. Ritter (1984) proposed that firm age might serve as a measure of a company's level of establishment. This implies that older organizations are more established to evaluate because they have a larger amount of comprehensive data regarding their operations and financial well-being. The vast amount of information available usually makes it easier to evaluate the actual worth of the company, resulting in a lower level of underpricing during the initial public offering (IPO). Zhou and Lao (2012) provide more evidence to support this idea, suggesting that there is a negative relationship between the age of a company at the time of its IPO and the extent to which its shares are underpriced. This can be attributed to a decrease in the difference in information between the company and potential investors. Therefore, it is probable that an established company, which has less difference in information between parties, will have less underpricing (MARI). This highlights the opposite correlation between the age of a company and underpricing. (MARI), because of how information is distributed and how investors perceive it.

Industry categorization plays a role in examining the initial and short-term returns of IPOs. This element is highlighted by studies conducted by Loughran and Ritter (2004) and Ritter (1991). This thesis uses the Industry Classification Benchmark (ICB) used by Nasdaq to categorize a sample of firms. To accurately measure the impact of having a technology firm on IPO underpricing, a dummy variable (TECH & TELECOM) is included. This variable is assigned a value of 1 for technology companies and 0 for all other companies. This thesis utilizes a tech dummy variable in regression models to explain differences in IPO underpricing (MARI). It is influenced by the analytical frameworks of previous studies, such as Loughran & Ritter (2004) and Daily, Certo & Dalton (2005), which highlight the increased vulnerability of technology firms to market dynamics and information asymmetry during their initial public offering.

The listing venue (LIST) variable serves as a measure to assess IPO underpricing (MARI) by distinguishing companies listed on the Baltic main list, which is assigned a value of one, from those on the first north Baltic, which is assigned a value of zero. This variable essentially captures the impact of a company's size and its associated risk profile on underpricing. The First North Baltic list, catering specifically to small and growing companies seeking to raise capital and enhance visibility, imposes less stringent regulatory requirements than the main market. Consequently, firms on the First North Baltic list are typically smaller, riskier entities confronted with higher ex-ante uncertainty—a condition closely linked to elevated levels of IPO underpricing, as per Beatty & Ritter (1986).

The sales revenue data is gathered from the financial statements of firms for the 12-month period before they went public. This data collection is based on the process of evaluating a company's financial well-being and market prospects just before it becomes publicly traded. Based on the research undertaken by Ibbotson, there is a pattern where companies with smaller sales revenue before their IPO tend to have higher levels of underpricing (MARI) (Ibbotson et al., 1994). This observation is based on the idea that smaller organizations have a higher level of uncertainty. Based on previous research and theoretical models, it is expected that the relationship between sales revenue (SALES) and underpricing (MARI) could be either positive or negative.

Several studies have shown a strong link between the IPO and the returns of the market index before the IPO. Underpricing tends to increase during periods of high market rates, as demonstrated in studies conducted by Loughran and Ritter (2002) and Ritter and Welch (2002). Data on market indices was gathered to examine the association between Baltic IPOs and the

overall performance of the market. The average market index returns for the 90 days before the IPO are calculated by analyzing daily price data. This data is then compared to the IPO's issuance date to determine a match.

2.3. Methodology

This research has a quantitative approach to empirically assess the short-term performance and underpricing of IPOs. This section presents the approaches used to evaluate IPO short-term performance and underpricing. The methods for calculating initial returns, wealth relatives, and conducting multiple linear regression analyses are detailed below. The purpose of using multiple linear regression is to investigate the impact of company-specific characteristics, offering details, and market conditions on the extent of underpricing.

2.3.1. IPO underpricing

To effectively assess underpricing, the raw initial returns (RI) are calculated by this approach:

$$RI \; = \; \left(\frac{P_m - P_0}{P_0}\right) \, x \; 100 \tag{1}$$

$P_m \; = \; stockprice\ at\ the\ end\ of\ the\ first\ trading\ day$
$P_0 \; = \; stock\ issue\ price$

The raw initial return facilitates the comparison of returns on a relative basis. It does not take into account the market's behavior during the same period. To evaluate the returns of the first trading day more accurately, market-adjusted initial return (MARI), introduced by Ritter (1991), is used. MARI is determined by deducting the benchmark-adjusted return from the raw initial return, as described below:

$$MARI \; = \; \left(\frac{P_m - P_0}{P_0}\right) - \left(\frac{M_t - M_{t,0}}{M_{t,0}}\right) \, x \; 100 \tag{2}$$

$M_t = index\ closig\ price\ first\ day\ trading$
$M_{t,0} = index\ closig\ price\ day\ before\ first\ day\ trading$

In an efficient market, individual stock returns are expected to align with market returns. When the market-adjusted initial return (MARI) equals zero, it signifies that the initial returns are aligned with market returns. A one-sample t-test is employed to determine whether the average MARI significantly differs from the hypothesized value of 0.

Null Hypothesis (H0): The average market-adjusted initial return is equal to zero.

$$H_0 = \mu MARI = 0$$

Alternative Hypothesis (Ha): The average market-adjusted initial return is not equal to zero.

$$H_a = \mu MARI \neq 0$$

To test this hypothesis stated above, we use student's t – test shown below,

$$T = \frac{MARI - \mu}{s \div \sqrt{n}} \quad \text{where:} \tag{3}$$

$MARI = $ the sample mean of the Market − adjusted returns

$\mu = $ the hypothesized population mean of the Market adjusted returns (0)

$s = $ sample stadard deviation

$n = $ sample size

2.3.2. Short-term performance

Ritter's (1991) Wealth Relative (WR) model is used to assess the short-term performance of IPOs. 1 month, 2 months, 6 months, and 12 months following the original offering are used to compute WR values. The following formula can be used to determine a share's WR value:

$$WR = \frac{(1 + r_{i,t})}{(1 + r_{m,t})} \quad \text{where:} \tag{4}$$

$r_{i,t} = $ return of stock i in period t

$r_{m,t} = $ return of index m in period t

According to Ritter (1991), if WR > 1, it indicates that the share has outperformed the benchmark index; conversely, if WR < 1, the benchmark index outperforms the share. It is assumed that a share is purchased once and held inactively throughout the investigation. A one-sample t-test is employed to determine whether the mean WR notably deviates from the hypothesized value of 1.

Null Hypothesis (H0): The average Wealth Relative value for IPOs is equal to one.

$$H_0 = \mu WR = 1$$

Alternative Hypothesis (Ha): The average Wealth Relative value for IPOs is not equal to one.

$$H_a = \mu WR \neq 1$$

To test hypothesis above we use t – test formulated belove:

$$T = \frac{WR - \mu}{s \div \sqrt{n}} \qquad \text{where:} \tag{5}$$

$WR = the\ sample\ mean\ of\ the\ Wealth\ Relative\ values$
$\mu = the\ hypothesized\ population\ mean\ of\ the\ Wealth\ Relative\ value\ (1)$
$s = the\ sample\ stadard\ deviation$
$n = the\ sample\ size$

2.3.3 Regression model

Regression analysis aims to investigate the correlation between the dependent variable (MARI) and the explanatory or independent variables (GDP), (SALES), (AGE), (PROCEEDS), (LIST), (TECH & TELECOM), and (MARKETS). Linear regression is the most commonly used form of regression analysis. It utilizes linear prediction functions to describe the relationship and predicts the unknown model parameters based on the available data. This thesis shows three Ordinary Least Squares (OLS) models. One model examines all independent variables; another model includes only financial factors; and a third model focuses on company-related variables.

The regression equation is represented by the following formula:

$$y = \beta_0 + \beta_1 x_1 + \cdots + \beta_n x_n + \varepsilon \qquad \text{where:} \tag{6}$$

$y = dependent\ variable$

$\beta_0 = intercept$

$\beta_1, \dots, \beta_n = regression\ coefficients\ for\ each\ independent\ variable$

$x_1, \dots, x_n = independent\ variables$

$\varepsilon = error\ term$

3. Empirical Study

This section presents the results of the empirical analysis, which was carried out using the methodology described in the previous chapter. The aim is to measure the performance of IPOs during their first year and determine the impact of company-specific traits, offering specifics, and market conditions on the degree of underpricing. First, descriptive statistics for the raw initial returns (RIs) and market-adjusted returns (MARIs) are presented, along with the factors being examined. The analysis further includes average MARIs categorized by measures such as listing venue, sales revenue, gross IPO proceeds, company age, industry, and market return 90 days prior to the IPO. Following that, regression results are presented, and the results discussed.

3.1 Descriptive statistics

Table 1, Descriptive statistics raw initial returns (RI) and market-adjusted returns initial returns (MARI)

	RI	MARI
Mean	10,73 %	10,56 %
Median	3,24 %	2,96 %
Standard deviation	0,36	0,36
Maximum	164,12 %	163,60 %
Minimum	-72,3 %	-72,74 %
n	36	36
T - Value		1,77
P - Value		0,08*

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

Table 1 shows the main descriptive statistics for raw initial returns (RI) and market-adjusted initial returns (MARI), which are indicators of IPO performance. Employing the student's t-test to examine the MARI, as detailed earlier in this study, provides a statistical examination of the proposed hypotheses.

The data revealed an average RI of 10,73% with a median of 3,24% and a corresponding MARI of 10,56% with a median of 2,96%. The average values exceeding the medians for both measures indicate a right-skewed distribution in initial returns; a minority of IPOs with exceptionally high returns is pulling the average above the median, which more accurately reflects the central tendency of the sample.

The range of the initial return values is large, with the highest MARI observed at 163,60% *(Bercman Technologies)* and the lowest at -72,74% *(Grab2Go)*. This large range suggests a massive variance in IPO performance. A closer inspection of the MARI reveals that most IPOs, precisely 67%, are underpriced, suggesting their issue prices are lower than the first-day closing prices. 33% are overpriced, indicating their issue prices are above the index's first trading day closing price.

The t-test provides a t-statistic of 1,77 for the MARI, implicating the average MARI as being greater than the hypothesized mean of 0. Given that the p-value associated with this t-statistic is 0.08, the result is not statistically significant ($p > 0,05$). Although the p-value is higher than the standard threshold for statistical significance, it does indicate a noticeable trend.

The findings didn't show strong statistical significance when we used the typical p-value threshold of 0,05. However, because of the limited sample size, relaxing the threshold to 0,10 revealed statistically significant results. This suggests that we fail to reject the alternative hypothesis based on our data. It highlights the importance of delving deeper into market efficiency since our results indicate an average MARI that differs from what we expected. Despite not meeting the standard 0.05 p-value for demonstrating inefficiency, this warrants further investigation.

Table 2, Descriptive statistics of independent variables excluding dummy variables.

	Mean	Median	Standard deviation	Minimum	Maximum	n
GDP %	4,23	3,76	0,15	-1,29	9,77	57
SALES (Millions)	103,3	16,34	247,24	0,01	1073,01	36
AGE (Years)	12,64	11,50	8,78	1	38	36
PROCEEDS (Millions)	38,45	7,95	84,55	0,34	450	36
MARKET %	2,82	1,06	7,17	-13,20	19,46	36

Source: author's calculations based on appendix 1 and 2.

Table 2 shows the main descriptive statistics for the independent variables, not including the dummy variables for industry and listing venue. Over the period from 2004 to 2023, the Baltic countries saw an average annual GDP growth rate (GDP) of 4,23%, with a median value of 3,76%. The peak growth rate occurred in Estonia in 2006 at 9,77%, while the minimum (-1,29%) was also recorded in Estonia in 2022.

In the year prior to the IPO, sales revenues (SALES) ranged from a high of €1073 million for *Ignitis Grupė* to a low of €0,01 million for *Grab2Go*. The median sales revenue (SALES) was €16,34 million, while the average sales revenue stood at €103,3 million. Given that the mean is significantly greater than the median, this suggests a right-skewed distribution of sales revenue data.

The mean age (AGE) of companies at the time of IPOs was 12,64 years, with a median age of 11,50 years. This indicates that companies in the Baltics that entered the public markets during the research period were well-established, with many years of operating experience. *Tallinna Vesi* was the oldest firm to go public, at 38 years old prior to the IPO, while *Airobot Technologies* was the youngest, at only one year old.

The gross proceeds of IPOs averaged €38,45 million, with a median of €7,95 million. *Ignitis Grupé* performed the highest offering, totaling €450 million, while *Grab2Go* raised the smallest, €0,34 million.

Table 3, Underpricing (MARI) by listing venue

	n	MARI
Main List	21	6,59 %
First North Baltic	15	16,1 %
T - Value		0,66
P - Value		0,58

Source: Author's calculations based on data from Appendix 1.

Table 3 presents main descriptive statistics about the listing venue (LIST) and the average degree of underpricing (MARI). On average, listings on the First North Baltic list where underpriced 16,1%, while those on the main list showed an average underpricing of 6,59%. These findings align with the hypothesis that companies with higher ex-ante uncertainty tend to yield greater initial returns. Given that the p-value is 0,58, it suggests that the difference in returns between the main list and First North Baltic list is not statistically significant.

Table 4, Company age and underpricing (MARI)

AGE (years)	n	MARI
Young ≤ 11	18	17,86 %
Old > 11	18	3, 24 %
T - Value		1,23
P - Value		0,23

Source: author's calculations based on data from appendix 2.

Table 4 show the distribution of underpricing across companies of different ages, categorizing them into two equally sized groups. The data indicates that companies aged 11 years or younger have an average underpricing of 17,86%, companies older than 11 years, which show an average underpricing of 3,24%. Despite this difference in underpricing (MARI), the difference is not statistically significant, as the p-value stands at 0,23, exceeding the significance threshold of 0,05.

Table 5, Revenue and underpricing (MARI)

SALES (millions)	n	MARI
Small ≤ 15	18	15,19 %
Large > 15	18	5,91 %
T - Value		0,77
P - Value		0,45

Source: author's calculations based on data from appendix 2.

Table 5 categorizes companies into two equal groups based on their sales revenue in the 12 months leading up to their IPO, labeling them as small and large. The analysis reveals that smaller companies have higher average underpricing (MARI) at 15,19%, while larger companies have an

average underpricing of 5,91%. These results are consistent with the belief that increased ex-ante uncertainty correlates with higher initial returns. However, with a p-value of 0,45, the difference between the underpricing of small and large companies is not statistically significant.

Table 6, Gross IPO proceeds and underpricing (MARI)

PROCEEDS (millions)	n	MARI
Small ≤ 8	18	14,58 %
Large > 8	18	6,65 %
T - Value		0,65
P - Value		0,53

Source: Author's calculations based on data from appendix 2.

Table 6 shows underpricing (MARI) in relation to the gross proceeds from IPOs, dividing the offerings into small and large categories with an equal number of companies in each. It was found that smaller offerings were underpriced more substantially, at an average of 14,58%, compared to larger offerings, which had an average underpricing of 6,65%. The difference in underpricing levels between small and large offerings is not statistically significant, as indicated by a p-value of 0,53, which exceeds the significance threshold of 0,05.

Table 7, Mean age, gross proceeds and underpricing (MARI) by industry

Industry	n	Mean age (years)	Proceeds (millions)	MARI
Tech & Telecom	4 (11 %)	13	14,47	10 %
Infrastructure & Utilities	10 (28 %)	13,4	87,78	16 %
Consumer Goods & Services	14 (39 %)	11,79	24,50	9 %
Financials & Real Estate	8 (22 %)	13	13,22	8 %

Source: Author's calculations based on data from Appendix 1 and 2.

Table 7 presents a results of IPOs by industry, along with the corresponding average underpricing (MARI), company age, and gross IPO proceeds, highlighting the uneven distribution of companies across different industry categories. Most companies fall under *"Consumer Goods & Services,"* with 14 companies representing 39% of the total. The smallest category is *"Tech & Telecom,"* with

only 4 companies, accounting for 11%. The highest initial returns (MARI) were observed in the *"Infrastructure & Utilities"* sector at 16%, while the lowest were in the *"Financial & Real Estate"* sector at 8%. This indicates that, on average, all industries experienced some level of underpricing during their IPOs in the Baltics from 2004 to 2023. The *"Infrastructure & Utilities"* sector not only had the oldest companies, with an average age of 13,4 years, but also had the highest gross proceeds, averaging €87,78 million. The *"Financial & Real Estate"* sector had the lowest gross proceeds.

3.2 Short – term performance

To assess the performance of IPOs during their first year, Wealth Relative values (WR) are calculated following the methodology outlined earlier in this thesis. WR values are determined at intervals of 1 month, 3 months, 6 months, and 1-year post-IPO. A WR value greater than 1 indicates that the IPO has outperformed the market index (OMXBBPI), while a WR value less than 1 suggests that the market index has surpassed the IPO in performance. Due to the unavailability of price data for some IPOs conducted in 2023, the sample size is smaller for the 6-month and 1-year intervals. To analyze the impact of initial returns (MARI) on the WR calculations, these values are computed both with and without incorporating the MARI.

Table 8, WR data including, first day returns (MARI)

	1 Month	3 - Month	6 - Month	12 - Month
Mean	1,01	1,03	1,06	1,03
Median	1,01	0,98	0,91	0,89
Standard Deviation	0,495	0,602	0,971	0,998
Maximum	2,85	3,51	5,97	6,04
Minimum	0,10	0,10	0,12	0,12
n	36	36	34	33
T - Value	0,130	0,255	0,337	0,188
P - Value	0,897	0,801	0,739	0,852

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

Table 8 shows the first-year post-IPO performance, integrates Wealth Relative (WR) values including the first-day returns (MARI). The study finds that 1 - month following the IPO,

companies present a promising start, with the average WR just over 1, implying a slight outperformance relative to the market index (OMXBBPI). However, the mean and median figures being same at this early stage denote a relatively even initial post-IPO experience.

A 3 - month interval, the mean WR rises slightly, suggesting some companies outperform the OMXBBPI. Nevertheless, the median falls below the mean, meaning that most of the companies are outperformed by the market index.

At the 6-month mark, the data shows a nuanced narrative. While the mean WR climbs to a more notable 1,06, the median's further decline to 0,91 signals that the outperformance reflected in the mean is not collectively shared; a larger proportion of IPOs are now underperforming, even as the overall average suggests growth.

One year after the IPO, companies show a decrease in their average WR, and the median WR continues to drop. This trend indicates that despite some IPOs sustaining high returns, the median has not maintained its earlier momentum when considering IPO performance against the market index.

An expanding standard deviation across the intervals shows growing disparity in individual IPO performances as time unfolds, highlighting that investor experiences can vary widely. The T-values and P-values serve as a statistical result on the observed patterns. The T-values remain modest across all intervals, and the P-values are decisively above the conventional 0,05 significance threshold, collectively indicating that student fails to reject the null hypothesis "H1= μWR = 1" since p > 0,05.

In summary, while some IPOs may have achieved noteworthy success, the broader assessment over the first year does not statistically distinguish them from the general market trends, suggesting a level of parity between the IPOs and market performance.

Tabel 9, WR data excluding first day returns (MARI)

	1 Month	3 - Month	6 - Month	12 - Month
Mean	0,91	0,91	0,90	0,87
Median	0,97	0,94	0,83	0,81
Standard Deviation	0,297	0,347	0,546	0,606
Maximum	1,84	2,08	3,53	3,57
Minimum	0,10	0,10	0,12	0,12
n	36	36	34	33
T - Value	-1,77	-1,54	-1,09	-1,24
P - Value	0,083*	0,131	0,281	0,220

Note: Significance levels for *** p < 0,01, for ** p < 0,05 and for * p < 0,01.

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

Table 9, shows Wealth Relative values (WR) after removing the impact of first-day returns (MARI), reveals a consistent trend over the post-IPO intervals measured. Initially, at the 1-month mark, the mean WR is below one at 0,91, with the median slightly higher at 0,97, suggesting that while the central tendency of the IPOs is to underperform the market index (OMXBBPI), more than half are still close to the market performance or slightly above it.

As time progresses to 3 and 6 months, the mean remains steady at 0,91 and then falls to 0,90, respectively. Simultaneously, the median shows a decline from 0,94 to 0,83. These shifts indicate that, as we move further away from the IPO date, most of the companies are yielding returns that are behind the market, and the gap between IPO performance and the market index extends for more than half of the sample.

By the end of the first year, the average WR values decreases to 0,87, reflecting a continued trend of underperformance compared to the market. The median follows downward trajectory, dropping to 0,81, underscoring that a most of IPOs are underperforming against the market.

The standard deviation reveals the spread or variability in performance among the IPOs, it increases with each interval. This suggests growing disparity in the IPOs' performance relative to

the market as time goes on, with some companies registering high outperformance and others underperforming.

The maximum values recorded shows that certain IPOs experience large gains over the market. However, the T-values, which are negative across all intervals, coupled with P-values that exceed the conventional significance threshold, suggest that on average, the IPOs do not significantly outperform the market after excluding first-day returns.

3.3 Linear regression

This section presents the multiple linear regression results. The purpose of the multiple regression model is to examine the effect of annual GDP growth rate (GDP), company revenues 12 month before IPO (SALES), IPO proceeds (PROCEEDS), industry (TECH & TELECOM), firm age (AGE), listing venue (LIST) and 90 – day market return prior IPO (MARKET) on underpricing (MARI).

Table 10, Univariate Regression Analysis of Potential Predictors for Underpricing

	Coefficient	Std. Error	P - Value
GDP	3,184	1,668	0,065*
SALES (log)	-0,011	0,021	0,594
AGE (1+log)	-0,038	0,085	0,661
PROCEEDS (log)	0,002	0,005	0,679
MARKET	1,732	0,808	0,039 **
TECH & TELECOM	-0,004	0,193	0,920
INFRASTRUCTURE & UTILITIES	0,077	0,135	0,569
CONSUMER GOODS & SERVICES	-0,033	0,125	0,787
FINANCIALS & REAL ESTATE	-0,041	0,146	0,780
LIST (MAIN)	-0,092	0,122	0,485
LIST (FIRST NORTH)	0,091	0,122	0,458

Note: Significance levels for *** $p < 0,01$, for ** $p < 0,05$ and for * $p < 0,01$.

Source: Author's calculations based on data from Appendix 1 and 2.

Table 10 shows the coefficients, standard errors and p-values from univariate regression analysis where each independent variable is measured against the dependent variable (MARI). Table shows that variables MARKET (p < 0,05**) and GDP (p < 0,10*) are statistically significant meaning that they may have some potential influence on the IPO underpricing (MARI). However, this should be viewed with caution because the univariate approach does not account for additional aspects. Variables adjusted using the natural logarithm, denoted by "log," is done if the date is highly skewed. For example, a 1% rise in SALES results in an average change in underpricing of -0,011 units, however this predictor is not statistically significant (p = 0,594).

This analysis provides insight into which factors may be worth investigating further in multivariate analysis, where intersections and adjustments for additional variables may produce different results. These findings will be compared to existing literature on underpricing and the relationship amongst hypnotized.

Table 11, Linear regression results

	Coefficient	Std. error	P - value
GDP	4,118	1,998	0,048**
SALES (log)	0,011	0,017	0,524
AGE (log+1)	-0,063	0,095	0,514
PROCEEDS (log)	0,001	0,198	0,608
TECH & TELECOM (dummy)	-0,103	0,198	0,608
LIST (dummy)	-0,211	0,158	0,191
Adjusted R-squared	0,164		

Note: Significance levels for *** p < 0,01, for ** p < 0,05 and for * p < 0,01.
Source: Author's calculations based on data from Appendix 1 and 2.

Table 11 shows the main findings of the linear regression model. The adjusted R square of 0,164 suggests that independent variables explain 16,4% of the variation in dependent variable underpricing (MARI). The p- values describe the statistical significance between the variables annual GDP growth rate (GDP), sales revenue 12 months before the IPO (SALES), company age (AGE), gross IPO proceeds (PROCEEDS), industry (TECH & TELECOM) and listing venue

(LIST) and the dependent variable underpricing (MARI). In this model only annual GDP growth rate was found to be statistically significant with p-value of 0,048 (p<0,05).

3.4 Discussion

These findings support the assumption that a thriving economy may boost investor confidence and market optimism, leading to higher underpricing. The significant positive effect of annual GDP growth (GDP) on underpricing (MARI) confirms the hypothesis that economic expansion is conducive to IPO activities. Specifically, the coefficient for GDP in the regression model was statistically significant (p = 0,048**) and positive, suggesting that as the GDP growth rates increase, there is a corresponding increase in the level of underpricing of IPOs in the Baltic nations.

Companies with smaller sales revenues 12 months prior the IPO experience a higher rate of underpricing in the Baltic region (table 5). This is consistent with the assumption that grater ex-ante uncertainty leads to higher initial returns. However, the relationship between (SALES) and underpricing (MARI) is not statistically significant (p = 0,524). Linear regression model shows that listing venue (LIST) and underpricing are negatively correlated, it suggests that listings on the Main market experience less underpricing than listing on the First North Baltic list. During the period listings in the First north market were more underpriced (table 3). These finding are consistent with the ex-ante uncertainty assumption, since companies listed in the First North Baltic are considered as smaller and riskier.

In previous literature older companies are presented as being more established and have less uncertainty about the value of firm and are less underpriced than younger companies. This study finds that young companies are more underpriced than the older companies (table 4). This is constant with the ex-ante uncertainty assumption, that less established companies may have higher underpricing due to uncertainty. Nevertheless, the regression model shows that the relationship between company age (AGE) and underpricing (MARI) is statistically in significant. Table 6 shows that the listings with smaller gross IPO proceeds are more underpriced than listings with bigger gross IPO proceeds. All the variables (SALES, LIST & AGE) that are used to as a proxy to measure uncertainty are constant with the assumption that smaller and less established companies

are more underpriced. Nevertheless, the regression model tells us that the relationships are not statistically significant.

Table 7 shows the underpricing difference in the industries presented in this study. Tech and Telecom companies was chosen to be industry dummy variable based on prior literature, Loughran & Ritter (2004) and Daily, Certo & Dalton (2005), which highlight the increased vulnerability of technology firms to market dynamics and information asymmetry during their initial public offering. The findings in this study are inconstant with the assumption that tech companies have higher underpricing, and the regression model shows that there is no statistical significance between the industry dummy (TECH & TELECOM) and underpricing (MARI).

CONCLUSION

To conclude, the empirical analysis offered in the thesis has contributed to revealing the short-term performance and underpricing of IPOs on the Nasdaq Baltic from 2004 to 2023. The primary goals of the research were to determine whether IPOs on this market are generally underpriced and how they perform comparatively to the benchmark index in the first year. Moreover, the study has researched the effect of company and offering specific variables and market climate on the underpricing.

Underpricing was exanimated by calculating raw initial returns (RI) and market adjusted returns (MARI). Short-term performance was evaluated in four intervals 1 month, 3 months, 6 months, and 12 months after the listing. The performance was evaluated by calculating wealth relative WR values to assess the performance against benchmark index OMXBBPI. For both MARI and WR this study developed hypothesis to test the statistical significance. Multiple linear regression model was applied to test statistical relationship between independent variables, annual GDP growth (GDP), sales revenue 12 months prior IPO (SALES), company age (AGE), gross IPO proceeds (PROCEEDS), industry (TECH & TELECOM), listing venue (LIST) and the dependent variable of underpricing (MARI).

This study showed evidence of underpricing in Baltic region in 2004-2023. On average the raw initial returns (RI) were 10,73 % and the market adjusted initial returns (MARI) were underpriced on average 10,56%. P-value of students one sample t test was 0,08 for MARI. Based on these findings, the null hypothesis is rejected with confidence of 0,10 which stated that the average MARI equals zero. These findings indicate a need for further research into market efficiency, as the results point to an average MARI that deviates from the expected value but lacks statistical significance.

In this study WR values were calculated twice, first including first trading day and then excluding the first trading day. On average WR values outperformed the benchmark index when first trading returns were included, but the median showed that most of the IPO's were outperformed by the

benchmark index on 3 months, 6 months and 12 months interval. WR values did not statistically differ from the hypnotized value of 1, meaning we fail to reject the null hypothesis. WR values excluding the first trading day returns failed to outperform the benchmark index on all intervals. Nevertheless, WR values excluding the first trading day did not statistically differ from hypnotized value of 1.

The linear regression model sowed only statistical significance between annual GDP growth (GDP) and dependent variable underpricing (MARI). Coefficients for (GDP) were 4,118 meaning that each one unit increase in GDP increases underpricing by 4,118 units.

This research contributes to the ongoing discourse on IPO performance and underpricing, particularly within the context of emerging markets like the Baltics. The results align with prior findings in IPO literature regarding the influence of market conditions and company attributes on underpricing. However, they also highlight the complexity and variability inherent in IPO processes and outcomes.

For future research, it would be beneficial to expand the sample size, incorporate additional explanatory variables, and possibly explore other time horizons beyond the first year to gain a more nuanced understanding of IPO performance dynamics. This could offer more comprehensive insights into the strategic decision-making of companies going public and the implications for investors and market participants.

LIST OF REFERENCES

Ales Cornanic & Jiri Novak, 2015. *"Signaling by Underpricing the Initial Public Offerings of Primary Listings in an Emerging Market,"* Czech Journal of Economics and Finance (Finance a uver), Charles University Prague, Faculty of Social Sciences, vol. 65(4), pages 307-335, August.

Allen, F., Faulhaber, G. R. (1989). Signalling by underpricing in the IPO market. *Journal of financial Economics,* 23 (2), 303-323.

Álvarez, S., González, V. M. (2005). Signalling and the long-run performance of Spanish initial public offerings (IPOs). *Journal of Business Finance & Accounting ,* 32 (1-2), 325-350.

Beatty, Randolph P., Ritter, Jay R. (1986)."Investment banking, reputation, and the underpricing of initial public offerings." *Journal of Financial Economics* 15(1-2): 213-232.

Carter, R. B., Dark, F. H., Singh, A. K. (1998). Underwriter reputation, initial returns, and the long- run performance of IPO stocks. *The journal of finance,* 53 (1), 285-311.

Choe, H., Masulis, R., Nanda V. (1993) Common Stock Offerings Across the Business Cycle: Theory and Evidence. *Journal of Empirical Finance,* 1 (1), 3-31.

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.

Garfinkel, J. A. (1993). IPO Underpricing, insider selling and subsequent equity offerings: is underpricing a signal of quality?. *Financial Management,* 74-83.

Grinblatt, M., Hwang, C. Y. (1989). Signalling and the pricing of new issues. *The journal of finance,* 44 (2), 393-420.

Ibbotson, R.G. (1975). Price performance of common stock new issues. *Journal of Financial Economics*, 2 (3), 235-272.

Ibbotson, R. G., Sindelar, J. L., Ritter, J. R. (1994). The market's problems with the pricing of initial public offerings. Journal of applied corporate finance, 7 (1), 66-74.

Jenkinson, T., Ljungqvist, A., Ljungqvist, A. P. (2001). Going public: The theory and evidence on how companies raise equity finance. (2nd Ed.) New York, USA: Oxford University Press. 4

Keloharju, M. (1993) The winner's curse, legal liability, and the long-run price performance of initial public offerings in Finland. *Journal of Finance Economics*, 34 (2), 251-277.

Kennedy, D. B., Sivakumar, R., Vetzal, K. R. (2006). The implications of IPO underpricing for the firm and insiders: Tests of asymmetric information theories. *Journal of Empirical Finance,* 13 (1), 49-78.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R. W. (1997). Legal determinants of external finance. *The journal of finance,* 52 (3), 1131-1150.

Levis, M. (1990). The Winner's Curse Problem, Interest Costs and the Underpricing of Initial Public Offerings. *The Economic Journal,* 100 (399), 76-89.

Nasdaq Baltic, Listing on NASDAQ OMX Baltic market. (2015). Nasdaq Baltic. Retrieved March 24, 2024, from https://www.nasdaqbaltic.com/files/vilnius/leidiniai/Listing_EN/files/listing%20en%20web.pdf

Nasdaq Baltic. *Shares - Share prices for all companies listed on Nasdaq Nordic*. Retrieved March 24, 2024, from https://nasdaqbaltic.com/statistics/en/shares.

Nasdaq Baltic. (2019, August 29). Nasdaq Baltic. https://nasdaqbaltic.com/about-us/about-nasdaq/

Ljungqvist, A. (2007). IPO underpricing. Handbook of empirical corporate finance, 375-422.

Loughran, T., Ritter, J. (2004). Why has IPO underpricing changed over time?. *Financial management,* 5-37.

PAZARZI, G., 2014. Critical Review of the Literature Regarding IPO Underpricing. International Journal of Economic Research, 11(2), pp. 277-289.

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

Ritter, J. R. (2011). Equilibrium in the Initial Public Offerings Market. *Annual Review of Financial Economics,* 3 (1), 347-374.

Ritter, J. R. (1998). Initial public offerings. *Contemporary Finance Digest,* 2, 5-30.

Rock, K. (1986). Why new issues are underpriced. *Journal of financial economics,* 15 (1-2), 187- 212.

Spiess, D. K., Pettway, R. H. (1997). The IPO and first seasoned equity sale: Issue proceeds, owner/managers' wealth, and the underpricing signal. *Journal of Banking & Finance,* 21 (7), 967-988.

Welch, I. (1992). Sequential sales, learning, and cascades. *The Journal of finance,* 47 (2), 695-732

Welch, I. (1989). Seasoned offerings, imitation costs, and the underpricing of initial public offerings. *The Journal of Finance,* 44 (2), 421-449.

World Bank, World Development Indicators / *DataBank*. (n.d.). https://databank.worldbank.org/reports.aspx?source=2&series=NY.GDP.MKTP.KD.ZG &country=CEB

Zhou, J. and Lao, L.-J. (2012) 'Analysis of influencing factors of IPO underpricing in chinext', *Physics Procedia,* 33, pp. 846–851. doi:10.1016/j.phpro.2012.05.144.

APPENDICES

Appendix 1. IPO date, Listing venue & Underpricing

Company	IPO Date	List	RI %	MARI %
Infortar	14.12.2023	Baltic Main List	0,4	-0,1
APF Holdings	9.11.2023	First North Baltic	-2,0	-2,2
Grab2Go	13.6.2023	First North Baltic	-72,7	-72,7
J.Molner	10.11.2022	First North Baltic	-5,2	-5,6
INDEXO	15.07.2022	Baltic Main List	3,6	3,1
Punktid Technologies	19.5.2022	First North Baltic	-32,7	-32,0
Robus Group	21.4.2022	First North Baltic	-33,6	-33,2
Airobot Technologies	10.2.2022	First North Baltic	13,7	14,1
TextMagic	15.12.2021	First North Baltic	68,0	68,0
Hepsor	26.11.2021	Baltic Main List	38,3	39,5
VIRŠI-A	25.10.2021	First North Baltic	2,7	2,5
Enefit Green	21.10.2021	Baltic Main List	20,3	20,7
Modera	15.10.2021	First North Baltic	-2,9	-3,5
DelfinGroup	28.9.2021	Baltic Main List	-0,3	0,8
Bercman Technologies	6.7.2021	First North Baltic	164,1	163,6
ELMO Rent	1.7.2021	First North Baltic	46,4	45,5
Saunum Group	18.12.2020	First North Baltic	69,0	68,9
Ignitis grupė	7.10.2020	Baltic Main List	-0,9	-1,1
Coop Pank	10.12.2019	Baltic Main List	-4,8	-4,9
NEO Finance	5.8.2019	First North Baltic	8,3	8,2
Tallinna Sadam	13.6.2018	Baltic Main List	13,4	13,4
Novaturas	21.3.2018	Baltic Main List	10,5	9,7
EfTEN Real Estate Fund	1.12.2017	Baltic Main List	12,9	12,8
MADARA Cosmetics	10.11.2017	First North Baltic	15,2	15,6
East West Agro	22.5.2017	First North Baltic	4,6	4,5
LHV Group	20.5.2016	Baltic Main List	1,0	1,0
PRFoods	5.5.2010	Baltic Main List	0,0	-1,7
Akola Group (Linas Agro Group)	17.2.2010	Baltic Main List	-0,8	0,1
AUGA group (Aqroville Group)	2.4.2008	Baltic Main List	-0,1	-0,6
Arco Vara	21.6.2007	Baltic Main List	0,0	-0,7
Ekspress Grupp	5.4.2007	Baltic Main List	20,3	19,9
Eesti Ehitus	18.5.2006	Baltic Main List	5,6	6,6
Vilkyškių pieninė	17.5.2006	Baltic Main List	2,9	2,8

Tallink Grupp	9.12.2005	Baltic Main List	0,7	0,7
Tallinna Vesi	1.6.2005	Baltic Main List	14,6	14,6
SAF Tehnika	26.5.2004	Baltic Main List	12,2	9,0

Appendix 2. Age, Industry, Revenue and Proceeds

Company	AGE	Industry	Revenue (Millions)	Proceeds (Million)
Infortar	26	Financials & Real Estate	1 053,7	31,2
APF Holdings	6	Consumer Goods & Services	0,7	5,2
Grab2Go	3	Infrastructure & Utilities	0,01	0,3
J.Molner	7	Health Care & Pharmaceuticals	0,5	0,7
INDEXO	5	Financials & Real Estate	1,6	7,5
Punktid Technologies	13	Tech & Telecom	0,7	0,8
Robus Group	17	Consumer Goods & Services	0,2	0,8
Airobot Technologies	1	Infrastructure & Utilities	0,5	0,8
TextMagic	20	Tech & Telecom	3,1	2,5
Hepsor	10	Financials & Real Estate	38,8	10,0
VIRŠI-A	26	Consumer Goods & Services	171,4	7,8
Enefit Green	5	Infrastructure & Utilities	147,0	175,0
Modera	14	Tech & Telecom	1,2	2,0
DelfinGroup	12	Financials & Real Estate	19,8	8,1
Bercman Technologies	5	Infrastructure & Utilities	0,2	0,8
ELMO Rent	5	Consumer Goods & Services	0,5	1,0
Saunum Group	6	Consumer Goods & Services	0,02	0,5
Ignitis grupė	7	Infrastructure & Utilities	1 073,0	450,0
Coop Pank	27	Financials & Real Estate	19,8	31,0
NEO Finance	5	Financials & Real Estate	1,0	0,6
Tallinna Sadam	27	Infrastructure & Utilities	121,3	147,4
Novaturas	20	Consumer Goods & Services	141,1	22,1
EfTEN Real Estate Fund	2	Financials & Real Estate	8,5	3,5
MADARA Cosmetics	11	Consumer Goods & Services	5,9	3,3
East West Agro	11	Infrastructure & Utilities	22,8	3,0
LHV Group	17	Financials & Real Estate	23,7	13,9
PRFoods	2	Consumer Goods & Services	68,7	12,9
Akola Group (Linas Agro Group)	19	Infrastructure & Utilities	322,6	27,7
AUGA group (Aqroville Group)	5	Consumer Goods & Services	12,9	9,8
Arco Vara	13	Consumer Goods & Services	31,0	63,1
Ekspress Grupp	18	Consumer Goods & Services	59,5	31,4
Eesti Ehitus	18	Infrastructure & Utilities	107,0	17,0
Vilkyškių pieninė	13	Consumer Goods & Services	26,6	1,4
Tallink Grupp	16	Consumer Goods & Services	218,0	182,9
Tallinna Vesi	38	Infrastructure & Utilities	6,5	55,7
SAF Tehnika	5	Tech & Telecom	11,6	52,6

Appendix 3. WR Values Excluding first trading day returns.

Company	1 Month	3 Month	6 Month	12 Month
Infortar	0,97	1,33		
APF Holdings	0,97	0,95		
Grab2Go	1,84	1,34	0,91	
J.Molner	0,90	0,81	0,79	1,45
INDEXO	0,98	1,00	1,01	0,89
Punktid Technologies	0,79	0,68	0,56	0,52
Robus Group	0,67	0,63	0,40	0,33
Airobot Technologies	0,98	0,92	0,72	0,77
TextMagic	1,10	0,97	1,02	1,00
Hepsor	0,84	0,86	0,72	0,71
VIRŠI-A	1,15	1,03	1,07	1,24
Enefit Green	1,18	1,13	1,23	1,48
Modera	0,89	0,87	0,78	0,96
DelfinGroup	0,86	0,93	1,03	1,19
Bercman Technologies	1,08	0,91	0,82	0,50
ELMO Rent	0,84	0,64	0,62	0,28
Saunum Group	1,18	2,08	3,53	3,57
Ignitis grupė	0,86	0,77	0,74	0,60
Coop Pank	0,95	1,02	1,05	0,99
NEO Finance	0,92	0,91	0,84	0,95
Tallinna Sadam	1,03	1,10	1,16	1,10
Novaturas	1,00	1,01	1,07	0,80
EfTEN Real Estate Fund	0,97	0,97	1,00	1,10
MADARA Cosmetics	1,04	1,10	1,05	1,17
East West Agro	0,62	0,51	0,52	0,51
LHV Group	0,10	0,10	0,12	0,12
PRFoods	1,03	1,00	0,93	0,84
Akola Group (Linas Agro Group)	1,05	0,99	0,88	0,73
AUGA group (Aqroville Group)	1,08	1,47	1,43	0,22
Arco Vara	0,86	0,71	0,73	0,81
Ekspress Grupp	0,83	0,73	0,66	0,62
Nordecon (Eesti Ehitus)	0,55	0,62	0,65	0,83
Vilkyškių pieninė	1,09	1,04	0,73	0,81
Tallink Grupp	0,21	0,22	0,24	0,17
Tallinna Vesi	1,07	1,05	1,15	1,19
SAF Tehnika	0,33	0,40	0,34	0,19

Appendix 4. WR values including first day returns.

Company	1 Month	3 Month	6 Month	12 Month
Infortar	0,97	1,34		
APF Holdings	0,95	0,93		
Grab2Go	0,50	0,37	0,25	
J.Molner	0,85	0,76	0,75	1,38
INDEXO	1,01	1,03	1,05	0,92
Punktid Technologies	0,53	0,46	0,38	0,35
Robus Group	0,44	0,42	0,27	0,22
Airobot Technologies	1,12	1,05	0,82	0,88
TextMagic	1,84	1,63	1,71	1,67
Hepsor	1,17	1,19	0,99	0,98
VIRŠI-A	1,18	1,06	1,09	1,27
Enefit Green	1,42	1,36	1,48	1,78
Modera	0,86	0,85	0,76	0,93
DelfinGroup	0,86	0,93	1,03	1,19
Bercman Technologies	2,85	2,40	2,16	1,31
ELMO Rent	1,23	0,94	0,91	0,41
Saunum Group	2,00	3,51	5,97	6,04
Ignitis grupė	0,85	0,76	0,74	0,59
Coop Pank	0,90	0,97	1,00	0,94
NEO Finance	0,99	0,99	0,91	1,03
Tallinna Sadam	1,17	1,25	1,32	1,25
Novaturas	1,10	1,11	1,19	0,89
EfTEN Real Estate Fund	1,10	1,10	1,12	1,24
MADARA Cosmetics	1,20	1,26	1,21	1,34
East West Agro	0,65	0,54	0,55	0,53
LHV Group	0,10	0,10	0,12	0,12
PRFoods	1,03	1,00	0,93	0,84
Akola Group (Linas Agro Group)	1,04	0,98	0,87	0,72
AUGA group (Aqroville Group)	1,08	1,47	1,43	0,22
Arco Vara	0,86	0,71	0,73	0,81
Ekspress Grupp	1,00	0,88	0,79	0,74
Nordecon (Eesti Ehitus)	0,58	0,66	0,69	0,88
Vilkyškių pieninė	1,12	1,07	0,75	0,83
Tallink Grupp	0,21	0,22	0,24	0,17
Tallinna Vesi	1,22	1,20	1,31	1,37
SAF Tehnika	0,37	0,45	0,38	0,22

Appendix 5. Non-exclusive licence

A non-exclusive licence for reproduction and publication of a graduation thesis[1]

I Max Yair Jonathan Leinson

1. Grant Tallinn University of Technology free licence (non-exclusive licence) for my thesis
IPO underpricing and short-term performance in Nasdaq Baltic 2004-2023,
supervised by Pavlo Illiashenko,

1.1   to be reproduced for the purposes of preservation and electronic publication of the graduation thesis, incl. to be entered in the digital collection of the library of Tallinn University of Technology until expiry of the term of copyright;

1.2   to be published via the web of Tallinn University of Technology, incl. to be entered in the digital collection of the library of Tallinn University of Technology until expiry of the term of copyright.

2. I am aware that the author also retains the rights specified in clause 1 of the non-exclusive licence.

3. I confirm that granting the non-exclusive licence does not infringe other persons' intellectual property rights, the rights arising from the Personal Data Protection Act or rights arising from other legislation.

_____

_____ (date)

---

[1] *The non-exclusive licence is not valid during the validity of access restriction indicated in the student's application for restriction on access to the graduation thesis that has been signed by the school's dean, except in case of the university's right to reproduce the thesis for preservation purposes only. If a graduation thesis is based on the joint creative activity of two or more persons and the co-author(s) has/have not granted, by the set deadline, the student defending his/her graduation thesis consent to reproduce and publish the graduation thesis in compliance with clauses 1.1 and 1.2 of the non-exclusive licence, the non-exclusive license shall not be valid for the period*