IPO UNDERPRICING AND AFTERMARKET PERFORMANCE IN OMX BALTIC

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By

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Abstract

This thesis analyzes the phenomena of IPO underpricing and subsequent aftermarket performance as well as factors influencing this type of behavior of new equity issues in Nasdaq OMX Baltic during the period of 2004-2014. The aim of this analysis is to provide new knowledge about the IPO market behavior in the Baltic countries. The analysis uses descriptive statistical techniques to estimate the magnitude of the IPO underpricing, Buy and Hold Abnormal Returns method for the comparison of IPO performance to benchmark portfolios, and regression analysis for the testing of possible explanatory variables influencing IPO underpricing.

It was found that new issues floated on Nasdaq OMX Baltic tended to be underpriced by an average of 7.54%. A statically significant explanatory model was created which established the relationship between IPO underpricing and factors influencing this behavior, of which proceeds raised during the IPO proved to be the strongest negative influence on IPO underpricing. Finally, while not statistically significant, it was found that after high first day returns new issues were underperforming their size matched equally weighted benchmark portfolios by -3.62% during the 1 year holding period and -0.08% during the 3 year holding period.

Keywords: IPO underpricing, IPO underperformance, Nasdaq OMX Baltic, Baltic states

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Introduction

Initial public offering (hereinafter - IPO) is a process where a privately held company sells its share of stock to general public for the first time. IPO provides a way for companies to raise capital by gaining access to public equity, while at the same time supplying the public with an investment opportunity. Many research papers pointed out that the shares in the IPO usually are substantially underpriced and those shares tend to drastically increase in value during the first day of trading (Ibbotson, Sindelar & Ritter 1994). This phenomenon is called IPO underpricing and has been a puzzle to researchers since the 1960s. The same observations are made today in many of the world's markets. However, underpricing is usually a short-term phenomenon while in the long-run IPOs are found to be severely underperforming their relative benchmark in three to five year period (Ritter, 1991; Loughran & Ritter 1995). The average initial underpricing depending on the country, fluctuates between 3.3% and 239.8%, with most countries falling into the 10 to 20% range (Ritter, 2014). The difference in returns between countries are analyzed in terms of different market mechanisms, contractual agreements, regulations and fundamentals of the firm going public (Ritter, 2014). The underpricing problem is significant both to the companies going public, which leaves "money on the table" by not correctly pricing their issue as well as investors, to whom this phenomena may appear as an exploitable trading opportunity, while the pattern of long run underperformance of IPOs may challenge efficient market hypothesis (Ritter, 1991). Furthermore, while the IPO behavior is widely analyzed in all types of equity markets around the world, so far no research have tried to analyze the IPO activity in the Baltic countries and Nasdaq OMX Baltic specifically. Thus the research object of this thesis is defined as IPOs that occurred in the Nasdaq OMX Baltic equity universe during the 2004-2014 period and their subsequent aftermarket performance.

The central research questions of this thesis is the existence and quantification of both IPO underpricing and underperformance phenomena in the Baltic equity market, together with the development of an explanatory model for underpricing.

The goal of this research is provide new knowledge about the IPO market behavior in terms of pricing and subsequent aftermarket performance in the Baltics as well as to supplement the existing knowledge about equity issuance process and new issues' performance in the Baltic stock market.

These specific goals will be reached by fulfilling three main objectives:

1. Extensive literature review of the existing empirical studies on IPO underpricing and aftermarket performance
2. Data collection of IPO pricing and performance in Baltics
3. Estimation of the existence and the magnitude of IPO underpricing phenomena in Nasdaq OXM Baltic.
4. Construction of an explanatory model of IPO underpricing influencing factors.
5. Evaluation of the aftermarket performance of IPOs by comparing to a set of benchmark portfolios' long term performance.

The subject of IPO performance is of practical importance to the issuing entity, because it directly deals with the amount of money that the company supposedly leaves on the table. If investors bid up the price of the issue during the day of sale, it is a clear signal that they were willing to pay more than the original issue price and thus the company would have been able to extract more money from the investors with a higher pricing. Secondly, a systematical and persisting underpricing of new issues may seem to present an exploitable trading opportunity for

various market players. Finally, the thesis will deal with a question of underperformance, which can help to illustrate whether or not it is practical to hold new issues as a long term investment strategy.

In addition to being a practical question, research on IPO performance is important in theoretical terms as there are still debates in the academia as to what really causes this type of behavior. Finally, although some research concerning IPO activity in the Baltics can be found, not a lot is known about the traits and peculiarities of the Baltic equity market when it comes to IPO's. That being said, the findings of this research could be helpful for future analysis of the IPO market as well as Baltic stock market in general.

The first part of the research will be dedicated to data collection. Nasdaq OMX Baltic market will be the research universe, which will be used to collect past IPO pricing data as well as descriptive firm specific data. The research will be covering a time period from 2004, since this was the inception of a common Nasdaq OMX Baltic market. Market data will be used to determine if underpricing exists and to describe the aftermarket performance of IPOs. In addition to that, Baltic companies listed on the Warsaw Stock Exchange will be analyzed as well and compared with the results obtained from Nasdaq OMX Baltic.

For the underpricing part, the research must be able to collect data on offer price, open price, close price and the market return during the first day of trading. This data will be used to compute the percentage of underpricing.

The research of aftermarket performance of IPOs presents a bigger challenge as the chosen methodology to measure long-term performance can greatly influence the results as well as the statistical significance of it (Cao & Wen 2013). Currently two of the most prevalent techniques

for long run return measurement are Cumulative Abnormal Return and Buy and Hold Abnormal Return, thus a more detailed literature analysis will be needed to determine which one is more suitable for the research. After the decision is made, benchmark portfolios will be created to compare the performance to that exhibited by IPOs.

Finally, the research will try to regress firm specific and market specific factors together with underpricing data in order to look for explanatory relationship of IPO underpricing. The exact methodology to be used for the regression analysis will be determined after the literature review process, which will analyze the most common techniques and the most prominent factors of IPO underpricing.

Literature Review

IPO Theory

IPO concept. Initial public offering (hereinafter – IPO) is the first sale of a company's shares to the general public. The IPO process leads to a stock market listing which is also commonly called floating or flotation. Initial public offering can also be simply called public offering as this definition denotes the fact that securities are sold to the general public instead of a direct sale to selected investors as would be the case in a private placement (FT lexicon, 2015). While it may seem straightforward at first, IPO is a both complex and complicated process with its own set of advantages and disadvantages.

The first and foremost question that is being answered by most research papers in this area of research is the advantages for a firm to actually go public. Traditional answers can be grouped under two broad categories: raising equity capital for the company in order to finance growth opportunities and business development costs and second, the ability for the company founders and existing shareholders to sell part or all of their stake in the company as the IPO process creates liquidity for the shares of the company (Espinasse, 2011).

At the same time, a new listing on a stock market carries a number of associated costs, such as increased accountability of a company usually coupled with a stricter monitoring and corporate governance and also the possibility for the original management to lose control of the company because of the broadening base of shareholders (Amadeo, 2015).

However, Ritter & Welch (2002) in their review of IPO activity gives a more thorough examination of the reasons and incentives for the company to go public and summarizes it into two main groups: Life Cycle Theories and Market Timing Theories.

Life Cycle Theories. Life Cycle Theories state that public companies are much more noticeable to the general public as well as potential acquirers. Public companies do not suffer from price concessions as private ones do, as potential acquirers can more easily pressure their takeover target than outside investors in a public company. This helps increase the value of the firm compared with an outright sale. Empirical evidence substantiating this statement is presented in the work of Brau, Francis & Kohers (2002) where by using a sample of more than 9,500 companies, the authors have successfully shown that private companies sold through a private takeover deal are on average experiencing a 22% liquidity discount as compared to companies that chooses to offer their shares through a public offering to the general investment public. Furthermore, many IPOs present an exit opportunity for venture capitalists who previously bought a stake in the company, increasing the control of entrepreneurs.

The same idea is reinforced by Chemmanur & Fulghieri (1999) whose theory explains the advantages and disadvantages of going public. While early angel investors are willing to pay lesser price than public investors due to their relatively undiversified portfolios, firms incur fixed costs associated with going public and proprietary information cannot be revealed for free as well. That is why, early in the life cycle it is more beneficial for a company to stay private, but eventually it can reach a point where it becomes optimal to go public.

Public trading on its own again brings both positive and negative reactions. It can add value by inspiring more faith in various stakeholders such as customers, creditors, suppliers as well as other investors. However, it can also bring unwanted product market competition if the company trades at a high public price.

Market Timing Theories. Many of the Market Timing Theories incorporate informational asymmetry as a model into their explanations. According to some, firms tend to delay their

equity issue if they know they are undervalued or if the bear market places a lower than acceptable value on the firm. Others suggest that, firms tend to follow the market as a source of valuable information and issue new equity when other good-quality firms issue or there are growth opportunities being signaled by higher prices. Ritter & Welch (2002) also proposes an explanation of their own, stating that entrepreneurs tend to derive their company value from internal business fundamentals and day to day involvement with the business and less so from the stock market, so sudden changes in the market values of publicly traded firms affect the sense of value of private firms with a lag. If we choose to follow this theory, it does not matter anymore whether if the market price is driven by irrational public sentiment or entrepreneurs' perceived value is created by private sentiment, because the sale of new shares will be more likely to happen after increased valuations in the stock market.

IPO research puzzles. After gaining an insight into why companies actually chose to go public through an initial public offering process, it is must be said that the current academic literature is still not in consensus about certain issues surrounding the IPO process that may be only seen after a more thorough analysis. First of all, in addition to the increased costs experienced by a public company, issuance costs tend to be the most debated additional costs. As PWC (2012) has reported in their statistical analysis of IPO companies, issuing companies tend to pay 5%-7% of the total gross proceeds from the sale of its shares to the underwriting banks which are responsible for distributing the shares to the investors. On top of that, various administrative and legal expenses that are incurred before the actual sale of shares to the public, inflates the total amount of expenses up to an average of 11% of total gross IPO proceeds (PWC, 2012). Second and third puzzles that has created unsettled debates in the academic community are the IPO underpricing and underperformance phenomena. IPO underpricing is a widely observed

phenomena where IPO shares' first trading day closing price tend to be significantly higher than the offer price that the initial investors receive. The aftermarket IPO performance, which is usually found to be negative, contradicts economic reasoning that high risk IPO companies should compensate investors by providing a higher return as well (FT lexicon, 2015). In order to start a discussion about these complex academic puzzles, the knowledge of the intricacies of the IPO process is required, which will be discussed in detail next.

IPO process. Many variations exist when defining what an initial public offering is, simply put an IPO is the sale of a company's securities to the public for the first time. However, Dietrich (2014) notes one very important detail that is omitted from many of these definitions as the fact that these new securities does not have an established market price yet.

The price setting is thus a very important part of the general IPO process and can be split in two main parts. First of all, before actually going public companies need to determine their business value. Dietrich (2012) argues that the two most popular approaches these days seems to be Relative Valuation, where the value of a company is determined based on a value of similar already publicly traded companies and Discounted Cash Flow (hereinafter - DCF) method, where the intrinsic value of the company is found by estimating the present value of future cash flows of the company. Kim & Ritter (1999) in their efficiency analysis of IPO valuation methods argues that valuing a company using price/earnings, price/sales, enterprise value / sales and enterprise value /operating cash flow ratios of comparable firms in the industry provides inaccurate pricing information if only historical data is used and in order to increase the accuracy, future forecasts should also be incorporated into the analysis. Additional adjustments can be made to the ratios in order to produce a better fit and increase the accuracy of pricing, moreover IPO underwriting banks that are usually responsible for the valuation of IPO, can

incorporate market demand into the valuation equation to come up with even better results (Kim & Ritter, 1999). By being able to choose the method of valuation, the underwriter is left with a lot of room for setting the price it desires to reach. Empirical studies have also shown that a wide variation usually exists between the offer price that is formulated by the underwriter and the subsequent market price that is observed in reality (Kim & Ritter, 1999).

Deloof, Maeseneire & Inghelbrecht (2002) has gone a step further and instead of analyzing the accuracy of ex post value estimates, looked at the accuracy of valuations by the lead underwriters. The authors concluded that the most popular valuation approach in Belgium was Discounted Free Cash Flow (hereinafter - DFCF) and Dividend Discount Model (hereinafter - DDM) in particular. Interestingly enough, the authors found that DDM did not yield superior accuracy over other models when predicting market value, however the analysis revealed that DDM on average underestimated the market price of the new issue, which may indicate a deliberate choice by the underwriters to underestimate the value of the issue by choosing a method that yields lower valuation figures (Deloof, Maeseneire & Inghelbrecht, 2002). Even the most prominent authors in the field, like Ritter and Welch (2002), had focused on the mechanism for setting the offer price and concluded that the underpricing puzzle can be solved by understanding how underwriters set the offer price for the issue.

A more recent study by Roosenboom (2012) has arrived at the same conclusions and reinforced the hypothesis that underwriters deliberately discount preliminary offer prices, which later contributes to IPO underpricing if the discount is not recovered in the pricing process.

After estimating the company's value, an offering price needs to be set. This is the second big part of the pricing process and it involves the underwriter cross checking the estimated company value with the potential investors (usually large institutional investors), to correctly evaluate the

demand existing in the market and match it by a correctly priced supply of new shares. In USA, which is the biggest market for new issues, this process is usually called the road show, where the issuer of new securities is presenting its issue to potential investors. This process usually involves the management of the company together with investment bankers from the underwriting bank, travelling around the country and presenting the new issue to analysts, pension funds and fund managers, while at the same time trying to grasp the possible demand for the issue as well as hints to its pricing structure. Some road shows can include clear offers to buy into the issue, while others (non-deal road shows) are simply used to extract information from the biggest potential clients (Road Show Definition | Investopedia, 2003).

Although this thesis is unable to completely grasp all the intricacies and associated parties in the IPO process, it cannot be stressed enough how important is the role held by the lead underwriter. It is the responsibility of the lead underwriter to keep everything together and communicate with all related parties in the process. The figure below details all the parties involved in the process of IPO deal and from just a quick glimpse it is clear that the central figure in all this is not the company being offered, but the underwriting bank that connects all the participating parties to make the deal happen.

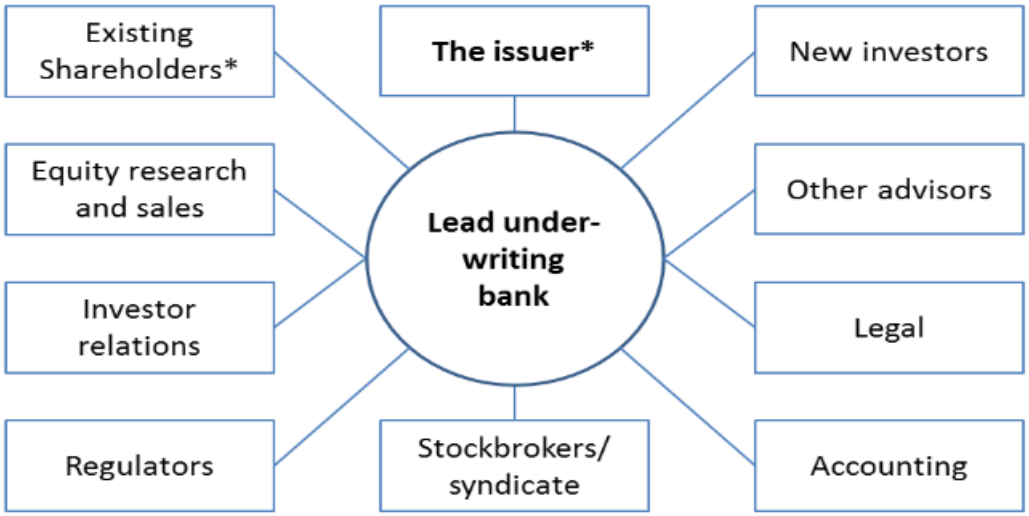

Figure 1. Visualization of interconnectedness of the lead underwriter and all the other remaining parties. Reprinted from "Variables Influencing the Severity of IPO Underpricing: An Empirical Analysis of the German Market" by J. Dietrich, J., 2012. *Hamburg: Diplomica Verlag*, p. 13. Copyright 2012. Reprinted with permission.

This special underwriter's role is not assigned by coincidence, but because the underwriter carries the responsibility for the successful placement of the offer. In addition to that, lead underwriter is also responsible for the valuation of the company, which needs to be a fair value price which should strike a balance between demand in the market and supply from the issuer.

The lead underwriter usually receives a percentage of the offering price as a compensation which is supposed to serve as an incentive, however as most of the time the same lead underwriter is in a sales syndicate distributing shares to the investors, which creates a conflict of interest as by signing a firm commitment contract, the underwriter becomes liable to sell the shares or absorb

the unsold issues. Dietrich (2012) sums up all this situation rather elegantly, "…the underwriter has considerable power and incentives to negotiate a final offer price that suits their own interests." (p. 13). In other words, underwriters may have an incentive to underprice in order to achieve full subscription of the offer.

Conflict of interest such as these are very important for this thesis primary topic of IPO underpricing as extensive debates about its potential influence on IPO underpricing phenomena can be found in the literature (Dietrich, 2012).

IPO Underpricing Theories

IPO underpricing is a phenomena when new issues tend to receive very high returns during the first day of trading. It is also referred to as abnormal returns of IPOs or simply the first day "pop". According to Adams, Thornton & Hall (2008) IPO underpricing is "the difference between the price obtained by the shares at the close of the first trading day and the price of the offer, adjusting for the market return in that same period" (p. 67). This phenomena has been well documented by Loughran, Ritter & Rydqvist (2014) and can be seen in its reproduced form in the Figure 2 below.

Country	Source	Sample Size	Time Period	Avg. Initial Return
Argentina	Eijgenhuijsen & van der Valk; Dealogic	26	1991-2013	4.2%
Australia	Lee, Taylor & Walter; Woo; Pham; Ritter	1,562	1976-2011	21.8%
Austria	Aussenegg	103	1971-2013	6.4%
Belgium	Rogiers, Manigart & Ooghe; Manigart DuMortier; Ritter	114	1984-2006	13.5%
Brazil	Aggarwal, Leal & Hernandez; Saito; Ushisima	275	1979-2011	33.1%
Bulgaria	Nikolov	9	2004-2007	36.5%
Canada	Jog & Riding; Jog & Srivastava; Kryzanowski, Lazrak & Rakita; Ritter	720	1971-2013	6.5%
Chile	Aggarwal, Leal & Hernandez; Celis & Maturana; Dealogic	81	1982-2013	7.4%
China	Chen, Choi, & Jiang; Jia, Xie & Zhang	2,512	1990-2013	118.4%
Cyprus	Gounopoulos, Nounis, and Stylianides; Chandriotis	73	1997-2012	20.3%
Denmark	Jakobsen & Sorensen; Ritter	164	1984-2011	7.4%
Egypt	Omran; Hearn	62	1990-2010	10.4%
Finland	Keloharju	168	1971-2013	16.9%
France	Husson & Jacquillat; Leleux & Muzyka; Paliard & Belletante; Derrien & Womack; Chahine; Ritter; Vismara	697	1983-2010	10.5%
Germany	Ljungqvist; Rocholl: Ritter; Vismara	736	1978-2011	24.2%
Greece	Nounis, Kazantzis & Thomas; Thomadakis, Gounopoulos & Nounis	373	1976-2013	50.8%
Hong Kong	McGuinness; Zhao & Wu; Ljungqvist & Yu; Fung, Gul, and Radhakrishnan; Dealogic	1,486	1980-2013	15.8%
India	Marisetty and Subrahmanyam; Ritter	2,964	1990-2011	88.5%
Indonesia	Suherman	441	1990-2013	25.0%
Iran	Bagherzadeh	279	1991-2004	22.4%
Ireland	Dealogic	38	1991-2013	21.6%
Israel	Kandel, Sarig & Wohl; Amihud & Hauser; Ritter	348	1990-2006	13.8%
Italy	Arosio, Giudici & Paleari; Cassia, Paleari & Redondi; Vismara	312	1985-2013	15.2%
Japan	Fukuda; Dawson & Hiraki; Hebner & Hiraki; Pettway & Kaneko; Hamao, Packer, & Ritter; Kaneko & Pettway	3,236	1970-2013	41.7%
Jordan	Al-Ali and Braik	53	1999-2008	149.0%
Korea	Dhatt, Kim & Lim; Ihm; Choi & Heo; Mosharian & Ng; Cho; Joh; Dealogic	1,720	1980-2013	59.3%
Malaysia	Isa; Isa & Yong; Yong; Ma; Dealogic	474	1980-2013	56.2%
Mauritius	Bundoo	40	1989-2005	15.2%
Mexico	Aggarwal, Leal & Hernandez; Eijgenhuijsen & van der Valk; Villarreal	123	1987-2012	11.6%
Morocco	Alami Talbi; Hearn	33	2000-2011	33.3%
Netherlands	Wessels; Eijgenhuijsen & Buijs; Jenkinson, Ljungqvist, & Wilhelm; Ritter	181	1982-2006	10.2%
New Zealand	Vos & Cheung; Camp & Munro; Alqahtani; Dealogic	242	1979-2013	18.6%
Nigeria	Ikoku; Achua; Dealogic	122	1989-2013	13.1%
Norway	Emilsen, Pedersen & Saettem; Liden; Dealogic	209	1984-2013	8.1%
Pakistan	Mumtaz	80	2000-2013	22.1%
Philippines	Sullivan & Unite; Dealogic	155	1987-2013	18.1%
Poland	Jelic & Briston; Woloszyn	309	1991-2012	13.3%
Portugal	Almeida & Duque; Dealogic	32	1992-2013	11.9%
Russia	Dealogic	64	1999-2013	3.3%
Saudi Arabia	Al-Anazi, Forster, & Liu; Alqahtani	80	2003-2011	239.8%
Singapore	Lee, Taylor & Walter; Dawson; Dealogic	609	1973-2013	25.8%
South Africa	Page & Reyneke; Ali, Subrahmanyam & Gleason; Dealogic	316	1980-2013	17.4%
Spain	Ansotegui & Fabregat; Alvarez Otera; Dealogic	143	1986-2013	10.3%
Sri Lanka	Samarakoon	105	1987-2008	33.5%
Sweden	Rydqvist; Schuster; de Ridder	374	1980-2011	27.2%
Switzerland	Kunz, Drobetz, Kammermann & Walchli; Dealogic	164	1983-2013	27.3%
Taiwan	Chen; Chiang	1,620	1980-2013	38.1%
Thailand	Wethyavivorn & Koo-smith; Lonkani & Tirapat; Ekkayokkaya and Pengniti; Vithessonthi	500	1987-2012	35.1%
Tunisia	Hearn	32	2001-2013	24.3%
Turkey	Kiymaz; Durukan; Ince; Kucukkocaoglu	355	1990-2011	10.3%
United Kingdom	Dimson; Vismara; Levis	4,932	1959-2012	16.0%
United States	Ibbotson, Sindelar & Ritter; Ritter	12,496	1960-2013	16.9%

Figure 2. Comparison of IPO underpricing observed in different countries.

Reprinted from "Initial Public Offerings: International insights" by T. Loughran, J. Ritter, & K. Rydqvist, 2014. *Pacific-Basin Finance Journal*, 2, p. 166-167. Copyright 2014. Reprinted with permission.

It is clear that underpricing effect cannot be attributed to a single country or an extraordinary time period. All countries without exception experience underpricing. The only difference is the magnitude of the underpricing phenomena between different countries. Figure 2 shows that

underpricing can range from as low as 3.3% to as high as 239.8%. However most of the countries fall into the 10%-20% bracket. The current academic thought is that these differences between the countries is no coincidence and Loughran, Ritter & Rydqvist (2014) had hypothesized and found empirical evidence supporting the view that the different levels of underpricing actually arise due different regulations and contractual mechanisms between different countries as well as firm specific characteristics. Moreover, Banerjee, Dai & Shrestha (2011) upon analyzing a sample of more than 8,700 IPOs in 36 countries have shown that IPO underpricing tend to be "higher in countries with higher levels of information asymmetry, lower home-country bias among investors, less effective contract enforcement mechanisms, and more accessible legal recourse in place" (p.26). These arguments would seem in line with the information presented in Figure 2, as it is clear that developing countries are experiencing a higher degree of underpricing than their more developed counterparts.

Figure 2 also illustrates that United States is a clear worldwide IPO market leader when taking into account its sample size while the closest competitor has a sample that is more than four times smaller. Due to this reason most of the research is also done on the USA market. Ritter (2014) has produced extensive list of statistics on the subject of IPO underpricing in USA equity market and one of the tables, detailing USA IPO market's historical underpricing is reproduced below.

Year	Number of IPOs	Mean First-day Return		Aggregate Amount Left on the Table	Aggregate Proceeds
		Equal-weighted	Proceeds-weighted		
1980	71	14.3%	20.0%	$0.18 billion	$0.91 billion
1981	192	5.9%	5.7%	$0.13 billion	$2.31 billion
1982	77	11.0%	13.3%	$0.13 billion	$1.00 billion
1983	451	9.9%	9.4%	$0.84 billion	$8.89 billion
1984	173	3.6%	2.4%	$0.05 billion	$2.07 billion
1985	187	6.4%	5.3%	$0.23 billion	$4.31 billion
1986	393	6.1%	5.1%	$0.68 billion	$13.37 billion
1987	285	5.6%	5.7%	$0.66 billion	$11.68 billion
1988	102	5.7%	3.5%	$0.13 billion	$3.72 billion
1989	113	8.2%	4.7%	$0.24 billion	$5.20 billion
1990	110	10.8%	8.1%	$0.34 billion	$4.27 billion
1991	286	11.9%	9.7%	$1.50 billion	$15.35 billion
1992	412	10.3%	8.0%	$1.82 billion	$22.69 billion
1993	509	12.7%	11.2%	$3.51 billion	$31.39 billion
1994	403	9.8%	8.5%	$1.46 billion	$17.25 billion
1995	461	21.2%	17.5%	$4.90 billion	$27.95 billion
1996	676	17.2%	16.1%	$6.76 billion	$42.04 billion
1997	474	14.0%	14.4%	$4.56 billion	$31.76 billion
1998	282	21.8%	15.6%	$5.25 billion	$33.65 billion
1999	476	71.0%	57.0%	$36.94 billion	$64.77 billion
2000	381	56.3%	46.0%	$29.83 billion	$64.86 billion
2001	79	14.2%	8.7%	$2.97 billion	$34.24 billion
2002	66	9.1%	5.1%	$1.13 billion	$22.03 billion
2003	63	11.7%	10.4%	$1.00 billion	$9.54 billion
2004	173	12.3%	12.4%	$3.86 billion	$31.19 billion
2005	160	10.2%	9.3%	$2.64 billion	$28.27 billion
2006	157	12.1%	13.0%	$3.95 billion	$30.48 billion
2007	159	14.0%	13.9%	$4.95 billion	$35.66 billion
2008	21	6.4%	24.8%	$5.65 billion	$22.76 billion
2009	41	9.8%	11.1%	$1.46 billion	$13.17 billion
2010	93	9.1%	6.1%	$1.83 billion	$29.94 billion
2011	81	13.3%	12.0%	$3.23 billion	$26.97 billion
2012	93	17.9%	8.9%	$2.77 billion	$31.11 billion
2013	157	21.1%	20.5%	$8.64 billion	$38.75 billion
1980-1989	2,044	7.2%	6.1%	$3.27 billion	$53.45 billion
1990-1998	3,613	14.8%	13.3%	$30.10 billion	$226.35 billion
1999-2000	857	64.5%	51.5%	$66.77 billion	$129.63 billion
2001-2013	1,343	13.3%	12.2%	$43.37 billion	$354.10 billion
1980-2013	**7,857**	**18.0%**	**18.8%**	**$143.51 billion**	**$763.53 billion**

Figure 3. Year by year analysis of "money left on the table" by IPOs in USA**.**

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In Figure 3 we can observe the number of issues that was floated on the IPO market each year, together with the average first day underpricing that these issues experienced. In addition to that,

Ritter (2014) details the aggregate proceeds that were raised in the process of IPO and the aggregate "money left on the table", a figure which illustrates how much money was not received by the issuing company due to the underpricing of the issue. When looking at the average (equal weighted) underpricing throughout the years, it appears that the number tends to fluctuate around the 10% mark, however the dot com bubble in the period of 1999-200 introduced extremely high underpricing figures, reaching 71% at its peak in the year 2000. This period should probably be considered an outlier when analyzing IPOs, since it is very realistic to assume that the steep underpricing during these years was experienced not because of the usual reasons identified in the literature, that was discussed earlier, but due to general stock market euphoria about new issues and a large number of retail investors that was involved in the IPO market at that time. However, the average first day underpricing can be seen steadily increasing throughout the decade leading to the dot com bubble. And interestingly enough, while aggregate proceeds of IPOs during this period (1999-200) of inflated valuations, had increased almost twofold, the aggregate money left on the table increased more than seven fold. The current figures of 2013 might paint a grim parallel to the previous situation as the average underpricing had risen to 21.1%. Consequently, while the aggregate proceeds had only increased by almost 25%, the average money left on the table increased more than three times. These figures may suggest that market is starting to experience increased positive sentiment yet again.

Hopefully, these discussions have managed to convince the reader that IPO underpricing can be a two sided medal. While it is plausible that the underwriter directly influences the issuing process in order to achieve a price that best suits his needs, it is also possible that IPO underpricing is experienced due to irrational actions from the investors.

Several theories, both rational and irrational have been developed during the years in order to explain why companies allow their stock to be underpriced and why investors are obsessed with IPOs and even tend to hold IPOs as a long term investment even though it appear to be underperforming (Adams, Thornton & Hall, 2008). Most prominent ones are summarized below.

Winners curse hypothesis. Rock (1986) in its winner's curse model assumes some investors are better informed than others. Better informed investors (institutional) tend to bid only for attractively priced IPOs and not unattractive ones. However, uninformed investors will tend to bid indiscriminately and due to rationing receive only a fraction of the most desirable issues and at the same time the full amount ordered of the least desirable ones. This situation is considered a Winner's Curse where they get what they asked for only because informed investors refused the new issue. Nevertheless, uninformed retail investors according to Rock (1986) are not able to absorb all the shares offered and that is why underpricing is necessary to incentivize and attract well informed institutional investors. This underpricing also protects the uninformed investors from negative returns whose capital is sought after even for attractive offerings (Institut numerique, 2012).

Market feedback hypothesis. Market feedback hypothesis argue that investors are not incentivized to reveal information about their demand for the offer if the information is positive, because they know this would lead to a higher offer price from the issuer, which is disadvantageous to them. Thus the issuer or the underwriter must underprice the issue and provide profit for the investors in return of revealing positive information.

At the same time, if the investor bids low for an issue that it highly values, it stands at risk of losing some of the allocation. In this sense, underwriters are able to reduce the underpricing by giving priority to some regular investors. In theory this should lead to more information sharing

between the underwriter and the investor, however very limited evidence has been presented to support the statement that these mechanisms do actually influence underpricing. (Dietrich, 2012)

Asymmetric information and signaling. Signaling theory assumes that the firm is always better informed about its future prospects than anybody else. And by underpricing its public offering, the company is signaling about its favorable prospects to the general public. This theory has empirical evidence to back this hypothesis as signaling usually occurs in certain industries at certain times (Allen & Faulhaber, 1989).

Principal agent problem. Jungqvist & Wilhelm (2003) in their analysis of dot com era IPO issuance found evidence that much of the initial underpricing can be connected to ownership structure and insider selling during the IPO period. They argue that these characteristics create incentives which later shape the behavior towards underpricing. In other words, if managers of the company does not own part of the company their incentives are not that strong to avoid underpricing compared to managers who are also owners. This was found to be a direct relationship, where more ownership by the managers translated into lower underpricing and vice versa.

IPO Underpricing Influencing Factors

Up to this point, we were mainly discussing theories and explanations related to the existence of IPO underpricing phenomena. However, we are also interested in what factors can actually have influence on underpricing and its magnitude. Dietrich (2012) for the regression analysis of the German IPO market used factors such as management ownership, pre-market demand, recent market movements, underwriting reputation, industry, company age and size. While Cao and Wen (2013) also included skewness, IPO volatility and industry momentum to the test as well.

While different researchers use different techniques in order to pin down the answer to the problem it must be noted that none of the answers or rather theories that has been provided was enough to completely explain the IPO underpricing behavior. Moreover, almost none of the theories has been mutually exclusive. That being said, it is also important to note that correlation between initial underpricing of IPO and the influencing factors associated with this type of behavior have not been proven to be straightforward, while the reasons for why investors choose to hold IPOs as long term investments are also unclear in the current literature (Adams, Thornton & Hall, 2008). With all this in mind, this section will try to discuss about variables, which are the most commonly used ones in IPO underpricing studies. It must be said, that only the most promising and practical variables have been chosen for the research, since the Baltic equity markets are still quite young and does not provide enough statistics for all of them to be tested.

Offer size. The size of the total new issue that is offered is an important criteria in IPO underpricing as studies have shown that offer size is inversely related to IPO underpricing (Clarkson & Merkley, 1994). Boudriga, Slama & Boulila (2009) explains this empirical relationship by the fact that the size of the offering is indicating the uncertainty within the new issue as large IPOs' can only be offered by an already well-established and reputable companies which should be inherently less risky. Thus investors require a lower premium in the form of underpricing in order buy a piece of the IPO.

Offer price. Debates can be found in the literature about the effects of the price level of the IPO. In other words how low and high nominal offer prices affect the underpricing. Boudriga, Slama & Boulila (2009) argues that the firm sets it offer price not arbitrarily but rather in a way that is consistent with the type of investors it wants to attract. Relatively low offer price tends to encourage the participation of potential small retail investors and significantly increase the

demand for the offered shares and consequently can increase underpricing. On the other hand, high offer prices tend to attract institutional investors, as they specifically avoid low priced issues (Boudriga, Slama & Boulila, 2009). Nevertheless, the presence of large institutional investors can also be associated with increased underpricing, since as discussed before, they actively participate in the book building process, provide valuable pricing information and expects to be compensated for it in the form of underpricing (Benveniste, Lawrence & Spindt, 1989). Institutional investors may also feel more secure, as higher offer prices have been connected to a higher certainty of future firm's prospects (Daily, Certo, Dalton, & Roengpitya, 2003). When looking at empirical research testing the effect that offer price level has on underpricing, Ibbotson (1975) finds that lower offer prices of new issues most of the time lead to increased levels of underpricing.

Market capitalization. Since large firms usually are better diversified and have better access to resources and capital, they are exposed to less uncertainty (Boudriga, Slama & Boulila, 2009). Prominent IPO researchers such as Ibbotson, Sindelar & Ritter (1994) have arrived at the same conclusion that negative relation actually exists between firm size and IPO underpricing by conducting empirical studies. This thesis will rely on the same conclusion and assume that increasing firm size reduces the magnitude of underpricing.

Firm's age. Boudriga, Slama & Boulila (2009) concludes that firm's age should have a negative impact on the degree of underpricing during the IPO. This hypothesis is reinforced by the fact that newly created firms do not have sufficient financial performance history on which financial analysts could draw conclusions, thus young firms instantly are viewed with more uncertainty. More mature companies however can reduce this information asymmetry by supplying potential investors or analysts with more historical data and financial reports. Thus, higher uncertainty of

the future performance of a company should lead to higher underpricing (Ritter, 1991), meaning that younger companies should on average be more vulnerable to underpricing. However, it would not be wise to use firm's age in the Baltics case, as the countries only recently regained independence and all the companies are rather similar in their age.

Industry. Another important criteria that the firm's overall risk depends on is the industry it is operating in. For example new industries often require high front end investments in order to develop the business model and ensure the sustainability of it, thus such industries most of the time are inherently more risky. Dot com bubble is the classic example used to describe the making of a new industry. Thus IPO studies usually flag technology industry or provide it with a dummy variable to mark it out from the rest of the industries (Dietrich, 2012). However, this is not possible in the Baltics due to the homogeneity and relatively small size of the equity market.

Management ownership. As discussed before, principal agent problem is one of the theories that are identified in the literature as a possible source of underpricing. Dietrich (2012) argues that managers have an increased incentive to strike a higher offer price if they own part of the company as well. Thus according to the principal agent problem, a negative relationship must exist between the pre-IPO ownership of management and the magnitude of IPO underpricing. Dietrich (2012) in the analysis of the German IPO market assumes that every owner who is also present on the board of directors can directly influence the IPO pricing process and thus distinguishes management ownership as the percentage of executive board membership.

Recent market movements. Dietrich (2012) argues that issuers could achieve a more favorable price for their IPOs if they would not anchor to the preliminary price range set during the pricing process. In other words, issuers should adapt their final price depending on general market movements that were observed. Loughran & Ritter (2002) in their study of IPO underpricing

determinants also includes the market return three weeks prior to the deadline for the IPO subscription and provides evidence supporting the theory that prior market movements positively influence IPO underpricing. The same issue has been touched upon in the work of Bakke, Leite & Thorburn (2012), who expressed their puzzlement at the issuers' inability to adjust the offer price to market returns during the book building process. The same authors tested this hypothesis against a sample of more than 5000 US IPO companies and found a positive correlation between the pre-issue return on the stock market index and initial underpricing. However, the effect was stronger when the public information was positive (positive market returns) rather than negative. Looking at all the evidence, this thesis will assume that pre market returns can positively affect the IPO underpricing. As for the specific market to benchmark the returns on, either one of the three Baltic market indexes will be used, depending upon which country the IPO originated from (Estonia – OMX Tallinn index, Latvia – OMX Riga index, Lithuania – OMX Vilnius index).

Turnover. Several research papers conducting empirical research on the relation between IPO underpricing and initial trading volume have noted that a positive relationship exists between these two variables (Yüksel & Yüksel, 2006). As with all other variables, some authors like Miller & Reilly (1987) links this tendency with uncertainty. That is to say that since underpriced initial public offerings tend to have the most uncertainty, this should be reflected in the trade volume as investors would want to correct the value of the security. According to Yüksel & Yüksel (2006), three main explanations exist in the literature today. First is that the underpricing is used by underwriters as a tool to create interest and by doing so increase the trading volume, from which underwriters may profit. Second, underwriters are using underpricing to reward investors for their effort in price discovery. And finally, underwriters are using underpricing in order to create permanent long term liquidity for the new issue in the market.

The outline of literature and academic views on IPO underpricing predictors represented above will be used as a good foundation on which to set the appropriate research methodology. However, as the Baltic IPO market is still very young and has scarce number of events in its history, having all this in mind, we must think realistically and understand that this thesis can only hope to add real if any value to the underlying reasons of the behavior. However, the main contribution of this work will be creating new and supplementing the already existing knowledge in the field of Baltic equity market and the environment for new public offerings.

Underwriter reputation. As discussed in the signaling theory section, in order to reduce asymmetric information between a firm and a potential investors, issuing firm wishes to signal its good future prospects. Dietrich (2012) states that one of the ways, a firm can achieve this is by choosing the underwriter, as high quality underwriting banks can be interpreted as a positive signal, since they are more likely to accurately represent information in the prospectus. Thus, the underwriter reputation hypothesis assumes that the choice of a more prestigious underwriter will result in lower underpricing. When methodologically dealing with the quantification of underwriter's reputation, Dietrich (2012) considers the percentage of total IPOs in a year that a given underwriter carries out, to be an indicator of its reputation. While underwriter's reputation have proven to be a reliable estimator of IPO underpricing, it would be impossible to use it as one of the variables for the regression analysis of the Baltic market, due to the limited number of IPOs in a year as well as the small number of underwriting banks.

Financial crisis. The recent global financial crisis was a big influence on the global financial markets and on equity markets especially. Having that in mind, financial crisis period should be viewed as an outlier, deviating from the normal market behavior and possibly represented as a separate factor in the regression studies. However, as shown before, IPOs tend to exhibit cyclical

behavior and adjust to the preceding market conditions. This was exactly the case in the Baltics as no IPOs were issued during the financial turmoil period, this allows to conduct the research without taking any additional steps to eliminate the effect of this extraordinary time period.

Long-term Aftermarket Performance Phenomena

So far, all the reviewed theories have concentrated on IPO underpricing as an isolated phenomena, however interesting conclusions can be drawn when long-run performance factor is taken into account. Long run event studies that are particularly focused on important corporate events, with IPOs being a prime candidate, exist as a separate field in various financial literature (Gur-Gershgoren, Hughson & Zender 2008). Purnanandam & Swaminathan (2004) argue that while IPOs are statistically underpriced, the median IPO tends to be significantly overvalued in relation to valuations based on peer group price multiples. Their cross sectional regressions covering time period from 1980 to 1997 have shown that while overvalued IPOs provided high first day returns, their long term risk adjusted return was lagging behind. The overvaluation was ranging from 14% to 50%. These findings were repeated when comparing different industries, price multiples and peer group selection procedures. The conclusion of their analysis is clear, investors are deceived by too optimistic growth forecasts of IPOs which fail to materialize.

Ritter (2014) have excellently summarized the five years of performance results of IPOs in USA during the period of 1970-2014. The reprinted table below shows that IPOs have underperformed other firms of the same market capitalization by an average of 3.2% when not taking into account the first day return, which is usually not achievable by market participants who did not secure an allocation in the primary IPO market.

Table 1.

Aftermarket performance summary of IPOs in USA during 1970-2014.

	First six month	***Second six month***	***First year***	***Second year***	***Third year***	***Fourth year***	***Fifth year***	***Geometric Means years 1-5***
IPO firms	6,0%	0,7%	7,1%	5,1%	11,0%	18,7%	12,4%	10,8%
Size-matched	5,2%	5,8%	11,5%	13,3%	14,4%	16,9%	14,0%	14,0%
Difference	0,9%	-5,1%	-4,4%	-8,2%	-3,4%	1,8%	-1,6%	-3,2%
No of IPOs	8,583	8,556	8,583	8,609	7,900	7,006	6,193	
IPO firms	6,5%	1,0%	7,8%	6,9%	12,0%	18,4%	11,0%	11,1%
Size & BM-Matched	3,9%	4,9%	9,2%	12,8%	11,9%	18,5%	13,2%	13,0%
Difference	2,5%	-3,8%	-1,3%	-5,9%	0,0%	-0,1%	-2,2%	-1,9%
No. of IPOs	8,397	8,370	8,379	8,226	7,505	6,613	5,823	

Note: Percentage returns on IPOs from 1970-2012 during the first five years after issuing. Reprinted from "Initial Public Offerings: Updated Statistics on Long-run Performance" by J. Ritter, 2014, p. 11. Copyright 2014 http://bear.warrington.ufl.edu/ritter/IPOs2013Longrun.pdf

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Even when matching firms on book to market ratio in addition to market capitalization, IPOs ten to underperform their counterparts by -1.9% during the five years after the issue. More dramatic results can be observed in shorter measurement periods. While IPOs statistically tend to over perform during the first six months from the issuing date, the picture changes later on with IPOs underperforming their size matched counterparts at -5.1%, -4.4% and -8.2% during the first, second and third year after the issuing date. Furthermore Ritter (2014) points out, that companies with the most severe underpricing tend to be the worst performers in the future as well which corresponds to the statements made by Purnanandam & Swaminathan (2004). Loughran &

Ritter (1995) provides a possible reason for this by hypothesizing that investors prefer longshots, hoping that they can find the new Microsoft. And if the assumed probability of success is overestimated by investors, it may take a very large statistical sample to correct the behavior. Loughran & Ritter (1995) also arrive at a more general conclusion about the IPO market as well, stating that IPO market exhibits cyclicality and issuers are taking advantage of it by timing their issues accordingly. Evidently, IPOs issued during years of low IPO volume tend to not underperform while the exact opposite is seen in firms issuing during boom periods in the IPO markets. These statements are also in line with the signaling theory that was discussed before.

Dietrich (2012) summarizes several of the most prominent theories of underperformance that exist in the literature today and as with underpricing, the underwriter conflict of interest comes to the spotlight once again. As we saw in the Table 1 above, 5 year IPO returns are underperforming their size matched market counterparts, thus stating that analysts' forecasts about growth were over optimistic. Dietrich (2012) points out that the gap between analysts' forecasts and reality tend to be wider when analyst is affiliated with the lead underwriting bank of the offering. And this effect is not just statistically significant, but more than twice as strong compared to nonaffiliated analyst's forecasts. Again this could be explained by the fact that banks simultaneously provide both underwriting and brokerage services to their clients.

Another interesting explanation is window dressing, where companies tend to "improve" their accounting statements before going public. Empirical backing to this explanation is provided by Teoh & Rao (1998), whose findings state that companies tend to manage their earnings opportunistically by specifically changing their depreciation policies and holding significantly less uncollectible receivables than their matched non-issuers which provides a company with a lower provision for bad debt. Evidence also suggest that managers may use aggressive accrual

recognition policies in order to inflate earnings. Obviously, such inflated earning levels cannot be sustained in the future and must be reverted at some point, causing underperformance (Dietrich, 2012).

Leaving theories aside, one important aspect in IPO underperformance research is methodology.

Cao and Wen (2013) in their work about IPOs aftermarket activity in Taiwan, detail two main possible choices for long-term return measurement: Cumulative Abnormal Return (hereinafter - CAR) and Buy and Hold Abnormal Return (hereinafter - BHAR).

However, Barber & Lyon (1997), state that CAR when predicting long term performance, is susceptible to biases such as measurement bias, new listing bias, and a skewness bias. Although this can be corrected by matching sample firms to the control group with similar size and book to market value, authors recommend using BHAR as a measurement for aftermarket performance and possible abnormal stock returns.

Ritter & Welch (2002) also argues that correct choice of benchmark companies is of vital importance and mistakes in this area still plagues the literature. IPOs statistically are small growth firms and this area of the market have been worst performing sector of the market for several decades now. Thus, poor long run performance of "similar to IPO firms" can essentially extend beyond the IPO market possibly influencing the results of the comparison. In other words, Ritter & Welch (2002) shows that seasoned firms matched by market capitalization underperform general market by almost as much as IPOs do.

Baltic Stock Markets

Although stock exchanges were established in all three Baltic countries around 1994, just after the first successful round of privatizations, it took roughly 10 years to reach acceptable and

comparable standards between all three exchanges in Riga, Vilnius and Tallinn. In 2004, all three countries accessed the EU, which in turn encouraged deeper integration of Baltic stock markets and all three countries' stock markets became part of the Nasdaq OMX group by then. This step marked consolidation of Baltic stock markets, integration of infrastructure, removal of market access restrictions for foreign investors and deeper corporate governance for listed companies (Darškuvienė, Keating & Žigienė, 2014). And while the market could not be technically called common until all three countries adopted a single trading and clearing currency in 2015, this harmonization of practices allowed a single joint Baltic market membership to be created as well as common Baltic market indexes and trading lists. Two main trading lists emerged and remains until now, the Baltic Main list and Baltic Secondary list. Both of these lists lies in the so called Baltic regulated market, which is supervised and regulated by various EU standards and directives and is intended for well established companies with mandatory financial reporting under IFRS rules (Jacikevicius, Raos & Backiene, 2014).

The Baltic Main List is comprised of stable and mature companies with at least 3 years of operating history, a solid financial standing, market capitalization which must be at least 4 Million Euros and a free float accounting to at least 25% of total shares or if not, the free float should have a value of at least 10 million Euros (Jacikevicius, Raos & Backiene, 2014). The companies represented in this list are seen as blue-chip investments, possessing substantial maturity financial stability.

The Baltic Secondary List is made out of companies that do not meet the requirements to be listed in the primary list due to either falling short on the free float or capitalization requirements. General admission requirements are also not as strict as in the primary trading list (Jacikevicius, Raos & Backiene, 2014).

IPO process in the Baltics. As stated in the previous chapter, regulatory requirements for stock exchanges have been harmonized over time in all three Baltic countries and regulation concerning IPO activity was not an exception (Blumbergs, 2005).

Blumbergs (2005) in its article "Walking through a Baltic IPO" summarizes the new equity issuance process in the Baltic countries extensively and defines its starting point as the company's decision to go public. Once this decision is made, financial reporting procedures are reviewed and if found - misrepresentations errors are corrected. Blumberg (2005) stresses the point of getting rid of related parties dealing extensively, as many companies tend to have transactions or agreements between the company and its management or shareholders. This issue arises since most companies that decide to float their shares in the Baltics tend to be relatively small as compared to other regions and thus still are very much interconnected with their founders. The median size of IPO in the Baltics was found to be equal to 23.81 million Euros, while the same measure in USA is equal to 111.4 million USD which is a lot bigger and usually signifies larger company sizes as well as larger shareholder base with more independent control (Wilmer Hale, 2014).

Blumberg (2005) also notes that many companies' management is still reluctant in fully cooperating with the auditors requirements for full disclosure of material information and considers it disadvantageous, thus underwriters sometimes face resistance and must educated newly issuing companies on this matter. This is very important since the investment prospectus aim is declaration of best possible knowledge about current situation in the company and its environment.

Once the due diligence procedures are finished, the prospect company must change its legal status into a joint stock company (AS in Estonia, SIA in Latvia and AB in Lithuania), only then it is allowed by law to issue its shares on a public stock exchange.

After meeting the legal requirements, the companies start a book building process in order to distribute sufficient amount of allocations and by doing so secure a safe and healthy start for the floating of shares. During this period, potential investors are supplied with a possible price range and indicate their preferences to the issuer. The final offer price is determined by matching supply and demand and usually is not known until just shortly before the start of official trading (Blumbergs, 2005).

One particularly interesting peculiarity of the commercial law in all three Baltic states, as noted by Blumbergs (2005), is the fact that the law requires full share premium to be paid upon subscription to the IPO. Once the share premium is paid, which is usually only part of the purchase price, only then the company is allowed to introduce changes to its charter to correctly reflect the new capital. This law introduces a potential settlement risk for the IPO and even more so for highly valued companies. Furthermore, the law does not explicitly talk about the possibility of blocking the required funds by the underwriter and thus the issuing company is unable to legally entitle the investors to the new shares until their purchase price have been paid fully. This could be easily be avoided with the alteration of the commercial law and reduce the financial costs to both related parties. However, only after the shares have been allotted as is required by law and trades are settled, the listing may start at Nasdaq OMX Baltic (Blumbergs, 2005).

General IPO market trends in the Baltics. The Table 2 below, which was reprinted from the Baltic Financial Markets handbook details the companies that went public in the Baltics during the period of 2004-2014.

Table 2.

IPOs and SPOs market in the Baltics during the period of 2004-20014.

Company	***Capital raised (€, mln)***	***IPO / SPO***	***Year***
SAF Tehnika	23,8	IPO	2004
Grindeks	18,2	SPO	2005
Starman	12,2	IPO	2005
Tallink Grupp	183,1	IPO	2005
Tallinna Vesi	55,5	IPO	2005
Eesti Ehitus (Nordecon)	18,9	IPO	2006
Olympic Entertainment Group	71,9	IPO	2006
Vilkyskiu pienine	1,4	IPO	2006
Arco Vara	96,8	IPO	2007
City Service	17,9	IPO	2007
Ekspress Grupp	36,1	IPO	2007
Latvijas Krajbanka	15,8	SPO	2007
Olainfarm	3,7	SPO	2007
Agrowill Group	9,8	IPO	2008
Latvijas Krajbanka	2,1	SPO	2009
Linas Agro Group	28,0	IPO	2010
Premia Foods	13,0	IPO	2010
Ekspres Grupp	7,9	SPO	2010
Baltika	3,0	SPO	2011
Grigiskes	2,9	SPO	2013
Pro Kapital Grupp	1,7	SPO	2013

Note: IPOs (SPOs) in 2004-2014. Reprinted from *Baltic Financial Markets Handbook*, p. 79, by V. Darškuvienė, C. Keating & G. Žigienė, 2014. Vilnius. Lithuanian Financial Market Institute. Copyright 2014. Reprinted with permission.

As can be seen from the Table 2, the time period of 2004-2014 included some companies offering their shares for the first time as initial public offerings, while other companies, which

were already listed, introduced their shares as a secondary public offering. The secondary offers are rather peculiar in this case, since for most companies this actually was their first public offering, however technically their shares have been trading on the exchange in the past, but they were not introduced to the exchange through a public offering mechanism and thus cannot be accounted as IPOs. This situation was caused by the privatization programs in all three Baltic states that were carried out during the years shortly after regaining independence from Soviet Union.

The average capital raised in the Baltics through an IPO mechanism was estimated to be 41.23 million Euros. The instantly notable boom period of IPOs was experienced during the period of 2005-2007. This increased public listing activity can be connected with the Baltic countries accessing the EU in 2004. As Darškuvienė, Keating & Žigienė (2014) noted, most of the money raised in the IPO process was used to fund business development and future acquisitions. After the financial crisis, the IPO activity seen in the previous year suddenly dropped due to the general market sentiment and also due to the fact, that interest rates had been significantly lowered by central banks around the world and companies suddenly were able to finance their needs through bank loans instead of seeking direct financing from the public markets. Darškuvienė, Keating & Žigienė (2014) also expressed their opinion stating that the future looks bright for IPO market in the Baltics, as governments should privatize even more state owned companies, through an initial public offering mechanism in the future.

Another important financing option that firms used instead of raising capital on the market was additional contributions, such as rights issues or non-right issues, where a company would offer additional shares to already existing shareholders, however these additional rights may not be

traded on the open market. The amount of capital raised in this way in the Baltics during the period of 2004-2013 is illustrated in Table 3 below.

Table 3.

Capital raised from additional contributions during 2004-2013.

Year	***NASDAQ OMX Vilnius***		***NASDAQ OMX Riga***		***NASDAQ OMX Tallinn***	
	New Issues	***Value €, mln***	***New Issues***	***Value €, mln***	***New Issues***	***Value €, mln***
2004	8	97,2	1	1,7	4	2,5
2005	6	52,1	2	18,2	2	140,2
2006	9	163,0	1	10,0	6	278,1
2007	7	143,8	6	83,7	2	92,9
2008	5	61,3	0	0,0	0	0,0
2009	4	66,3	3	65,4	2	4,4
2010	5	98,7	1	13,9	3	27,9
2011	3	15,2	0	0,0	1	3,0
2012	1	39,0	0	0,0,	1	0,7
2013	1	2,9	0	0,0	2	3,2
Total	49	739,4	14	192,8	23	552,8

Note: Capital raised of Baltic listed companies 2004-2013. Reprinted from *Baltic Financial Markets Handbook*, p. 80, by V. Darškuvienė, C. Keating & G. Žigienė, 2014. Vilnius. Lithuanian Financial Market Institute. Copyright 2014. Reprinted with permission.

While the total amount of money raised through IPOs and SPOs in the Baltics during the 2004-2014 was 623.7 million Euros, capital raised from additional contributions surpassed this figure more than two times and amounted to 1,485 million Euros. These figures stand to illustrate that investors are more willing to put their money into already companies that are already on their feet and running.

However, as can be seen from Table 3, IPO financing was not the only one to suffer from the global crisis. While additional capital contributions was a popular and rather large choice among the companies up to 2008, the popularity dropped due to more financially appealing options available, such as using retained profits or obtaining bank loans (Darškuvienė, Keating & Žigienė, 2014). Interestingly enough, while the liquidity for additional contributions dried up in Latvia and Estonia in 2008, the same figure for Lithuania had stayed relatively high during the crisis period.

Baltic Listings in Warsaw Stock Exchange (WSE)

When going public, Baltic companies are not limited in their choices only to the Baltic region together with Nasdaq OMX Baltic stock exchange. Since all three Baltic countries accessed European Union in 2004, it gained the ability to allow Baltic companies to list their shares on other European exchanges more easily. While it seemed, the whole Europe and all its various exchanges were now suddenly at the Baltic companies' service, historic performance had shown that the Warsaw Stock Exchange (WSE) located in Warsaw, Poland was the most successful foreign market to attract Baltic companies to list their shares abroad. Kwiatkowsky (2010) tries to explain this fact through the argument that Poland and WSE both provide a cultural and geographical proximity, which is very appealing to companies from the Baltic States as well as companies from Central and Eastern Europe.

Poland as well as all three Baltic countries was in a similar situation in 1991 as all these countries regained independence after the collapse of Soviet Union. Warsaw Stock Exchange started its operation in 1991 straight after regaining independence and at the time the company was fully owned by the State Treasury of Poland. Currently, the government of Poland had

reduced its ownership percentage to 35% as part of the strategy to create an independent stock exchange which would be able not only to grow without state's help, but also be independent in managing itself. The remaining 65% were sold off on an open market through an IPO to investors that wanted to own part of Warsaw Stock exchange as a business (Warsaw Stock Exchange, 2015).

In comparison, stock exchanges in the Baltic region had started operating only around 1994. The distribution and growth of national and foreign companies in Warsaw Stock Exchange can be seen in Table 4 below.

Table 4.

Number of companies in WSE from 1991 to 2015 (Warsaw Stock Exchange, 2015)

Year	**1991**	**2003**	**2009**	**2010**	**2014**	**2015**
Number of companies	9	203	379	400	471	471
Of which foreign	---	1	25	27	51	51

Note: created by the author

While WSE had started with only 9 companies listed on the exchange in 1991, this number grew to 471 companies in 2015. The listing of first foreign company on WSE coincided with Poland's choice to join the EU, which was expressed in a national referendum in June 2003. The period from 2003 to 2009, marked a significant growth in the WSE as a whole and its foreign listings. While total number of companies almost doubled in WSE from 2003 to 2009, the amount of foreign companies listed in Warsaw has increased from a single company in 2003 to 25 companies in 2009. This miraculous growth was almost brought down to a halt during the years of the global financial crisis, however it regained its momentum in 2010. Again WSE was

showing strong growth in its foreign listings, where the number of foreign companies listed on WSE almost doubled from 2010 to 2014.

While the high growth rate in the number of companies listed on the exchange is admirable, WSE can also be praised on its wide selection of financial products offered on the exchange. Currently there are 110 Bonds, 129 future contracts and 216 options contracts listed on the Warsaw Stock Exchange. These figures makes Warsaw Stock Exchange as it calls itself "the largest national financial instruments exchange in the region of Central and Eastern Europe" (the Central and Easter Europe region includes the following: Poland, Czech Republic, Slovakia, Slovenia, Bulgaria, Romania, Austria and Hungary) (Warsaw Stock Exchange, 2015). Furthermore, Warsaw Stock Exchange managed to increase its market share (percentage of shares traded on WSE compared to the whole region) in the Central and Eastern Europe region form 54.3% to 58.5% in just one year from 2012 to 2013. The exemplary performance of Warsaw Stock Exchange is no coincidence and more likely a result of the meticulous strategy followed by WSE. The strategic goals of the exchange are made public every year on its website, and usually contains a strong focus on active acquisition of new issuers on WSE. Together with a proactive approach in attracting new listings, WSE is also trying to continuously improve the environment for these listings by reviewing, shortening and simplification of procedures as well as removal of hurdles that may hold a new issuer from becoming a member in WSE (Tamborski, 2014).

Warsaw Stock exchange similarly to Nasdaq OMX Baltic is divided into segments or trading lists. Three main distinctive markets exist on WSE: WSE Main Market, which is an EU regulated market specializing in equity and equity related financial instruments, money market funds and derivatives; NewConnect, which is a non-regulated market on WSE specializing in

trading equity and equity like products of small and medium enterprises. Finally, WSE contains the Catalyst market, which is a specialized market for corporate, municipal, Treasury and mortgage bonds with a separate trading system (Kwiatkowski, 2010).

Since the WSE Main Market is an EU regulated market, it faces the same rules as the Nasdaq OMX Baltic primary trading list. That is why, this thesis will be focusing on WSE Main Market for comparison purposes between Polish and Baltic exchanges and their subsequent performance. As of 2015, there were four Lithuanian (AviaAM Leasing AB, Avia Solutions Group AB, Agrowill Group AB, Inter RAO Lietuva AB) and two Estonian companies (Olympic Entertainment Group AS and Silvano Fashion Group AS) listed on the Warsaw Stock Exchange main regulated market (Warsaw Stock Exchange, 2015). Due to this fact, Warsaw Stock Exchange is of particular interest to this study.

Although, as some authors have noted, companies in transition economies do not exclusively rely on public share offerings abroad and instead use various methods to obtain foreign funding, such as American depository receipts (ADRs) for example, such listings from both Estonia and Latvia in 2001 had accounted for roughly one third of total domestic market capitalization (Bokros, Fleming & Votava, 2001) and thus direct listing of shares on a public market have been the main tool for selling equity. In addition to that, the research object and main emphasis of this thesis is on initial public offerings and other types of equity financing are not of interest to this particular research.

IPO activity on Warsaw Stock Exchange (WSE). As Poland accessed the EU by a referendum in June 2003, this date marked a good starting point to analyze the Polish equity market and compare it to the Baltic countries, since due to the common rules and regulations set by EU on all member countries, it can be directly compared to the Baltic equity market.

Sieradzki (2013) in its paper on polish IPOs analyzes the IPO market in Warsaw stock exchange during the period of 2003-2011.

Table 5.

The WSE IPO market descriptive statistics during the period of 2003-2011

	2003	***3004***	***2005***	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***
Number of IPOs	6	36	25	28	81	33	13	34	38
IPOS value (in PLN millions)	1,358	12,743	6,981	4,155	26,942	2,803	583	1,283	417
Value of new share issues (in PLN millions)	1,228	1,116	5,249	2,445	24,016	464	575	302	121
Average IPO value (in PLN millions)	226	354	199	109	333	85	45	36	11
Market capitalization of companies (in PLN billions), of which:	167.7	291.7	424.9	635.9	1,080.3	465.1	715.8	796.5	642.9
- ***domestic companies***	140.0	214.3	308.4	437.7	509.9	267.4	421.2	542.6	446.2

Note: The WSE equity market selected statistics 2003-2011. Reprinted fron "Does it pay to invest in IPOs? Evidence from the Warsaw Stock Exchange" by R. Sieradzki, 2013, *National Bank of Poland,* 139, p. 11. Copyright 2013 https://www.nbp.pl/publikacje/materialy_i_studia/139_en.pdf . Reprinted with permission.

As was the case in the Baltic region, the same situation can be observed in Poland, where the IPO market is experiencing a bullish period with high growth rates an increasing number of IPOs during the period of 2003-2007. This was followed by a sharp reduction in the amount of IPOs that was issued, because of the global financial crisis and general lack of confidence in the stock market. However, the IPO market in Poland started showing signs of recovery from 2010

onwards, then the number of IPOs started climbing again. The same situation has played somewhat differently in the Baltics as last two IPOs were offered in the market in 2010 then followed by a couple of SPOs in 2013.

The average size of IPO on WSE can be converted from PLN to EUR and is equal to 56.5 million Euros. However, this figure drops significantly after the crisis (11.25 million Euros in 2009, 9 million Euros in 2010 and 2.75 million Euros in 2011). Although the reduction in the average size is huge, the number of companies issued during a particular year had returned to the pre-crisis level. This may signal that WSE was overall successful in its strategy to reduce barriers to entry on its stock exchange and attracting listings of small companies.

Research Problem

As of yet, very limited amount of research was conducted on the IPO market dynamics in the Baltics. Although IPOs represents a large percentage of total funding for new companies, not much is known about the performance and the hidden costs of the IPO process in the Baltics. After analyzing the empirical results from various countries and equity markets around the world, the underlying assumption of this thesis will be that the IPO underpricing does indeed exist in the Baltic equity market. The fundamental question of this thesis thus will be related with the proof of existence and quantification of IPO underpricing phenomena in the Nasdaq OMX Baltic equity market and subsequent comparison with the underpricing experienced by Baltic companies listed on the Warsaw Stock Exchange in Poland. Furthermore, if underpricing does indeed exist in the Baltic equity market, so far the existing literature did not provide analysis of the influencing factors of this phenomena. If statistically significant information can be obtained, it could serve as a possible indicator for future IPO companies wanting to avoid underpricing by understanding what actually causes it.

In addition to that, not much is known about the subsequent performance of IPO issues in the Nasdaq OMX Baltic and how well new issues are doing as compared to their already established market counterparts. While the underpricing results can help shape the potential future IPO issues, IPO aftermarket performance information could enhance the decision making process of potential investors by examining the performance of new issues as longer term investments.

Empirical Research

This chapter will systematically analyze the central research question of this study, its objectives and strategy that will be implemented in order to accomplish these goals. As stated in the introductory part, the central question of this thesis is the existence and quantification of both IPO underpricing and underperformance phenomena and their possible causes in the Baltic stock market.

It must be noted that the author believes that both underpricing and long run underperformance should exist in the Baltic stock markets as this phenomena have almost universally been documented around the world. Thus the thesis will assume that these phenomena exist, until opposing evidence is found by the analysis.

This chapter will cover the details of research objectives, its scope, data collection sources, together with tools and techniques that will be used in the research.

IPO Underpricing and Underperformance Measuring Methods

This thesis will use various statistical tools to describe the obtained data as well as specific performance comparison procedures and regression analysis which will hopefully allow us to make a tangible and easily graspable conclusion.

Measuring underpricing. The underpricing of the new issues arises from the fact that the offer price, which is the price at which shares are sold to the investors tends to be smaller than the market or opening price, which is the price at which those shares begin to trade in the public market. (Fedorov, 2015) In order to measure the size of the underpricing, the thesis will use a general percentage return formula together with offer prices and first day closing prices, obtained in the data collection stage. Finally, the daily return of corresponding stock exchange index in which the issue is floated will be subtracted.

$$Underpricing\% = \frac{(closing\ first\ day\ market\ price - offer\ price)}{Offer\ price} - \frac{OMX(Tallin;Riga;Vilnius)close}{OMX(Tallin;Riga;Vilnius)open} \times 100\% \quad (1)$$

Although this appears to be a straightforward step, as explained earlier the main challenge lies in data collection.

Measuring underperformance. There are still ongoing debates in the asset pricing literature as to what model or theoretical framework to use in order to measure post-IPO performance of stocks. As Ritter & Welch (2002) noted in their literature review of IPO underperformance, so far the asset pricing field has failed to provide a clear answer and the main issue remains how abnormal the actual post-IPO performance is. This as was made clear in the literature review section is mainly dependent on the chosen measurement procedure. However, a lot of authors, such as Barber & Lyon (1997), Ritter & Welch (2002) and Cao & Wen (2013) all point out the BHAR as an acceptable method of measuring, furthermore since it appears to be the most popular one in the literature, using BHAR will allow a direct comparison with the results from other studies.

That being said, this thesis will apply the BHAR method of measurement over one and three year period following the IPO date in order to measure the long run performance of IPOs compared to reference portfolio of stocks. Unfortunately, it is impossible to measure longer term performance, since most companies financial statements are only available until 2013 while some IPOs occurred in 2010. The precise methodology is derived from the work of Cao and Wen (2013) which uses firm size and book-to-market ratio in order to construct benchmark portfolios as these variables are usually quoted as being stable predictors of performance. However it is impossible to implement it fully as the authors use firm size measured in market capitalization and book-to-market ratio (B/M) as two variables when constructing a reference portfolio. This is not possible in our case since neither Nasdaq OMX Baltic nor Morningstar provide sufficient statistics on historical book values of companies in the Baltics. Having said all that, only firm size in terms of market capitalization will be used as a criteria when constructing benchmark portfolios. A study provided by Gur-Gershgoren, Hughson & Zender (2008) revealed that the statistical power of tests of underperformance are increased significantly until at least 3 companies are used to construct the benchmark portfolio. Thus the methodology of this thesis will rely on this finding and construct benchmark portfolios containing 3 closest matching companies as measured by their market capitalization. Furthermore, only the Primary list of Nasdaq OMX Baltic universe will be used as the initial analysis revealed that all of the IPOs with the exception of only one company was issued on the Primary Trading list.

At the end of the year when the actual IPO took place, all stocks in the Nasdaq OMX Baltic primary trading list, will be ranked by size as measured by its market capitalization. The size of IPOs firms will be measured by their market value of equity during the first day of trading as this will exclude the effect of underpricing. Then three best matching reference companies will be

selected to benchmark against the IPO event company. No re-ranking of portfolios will be carried out during either the one or the three year measurement periods as this will remove the need of rebalancing and also takes into account the fact that new issues are able to change the composition of existing portfolios. The firms in the portfolios will be also equally weighted.

The exact formula for BHAR calculation is provided by Barber & Lyon (1997) and is shown below.

$$BHAR = \prod_{t=1}^{t}[1 + R_{it}(IPO)] - \prod_{t=1}^{t}[1 + R_{it}(Reference)] \qquad (2)$$

Regression analysis. Until now, we have entirely focused on the tools for measuring underpricing and underperformance and the existing theories which explain why this exists in the market. However the main issue that will be dealt with in this part of thesis will be the analysis of factors which may have an influence on the existence and size of the underpricing in the Baltic stock market.

Description of variables. Although, the data collection stage might influence the research process development, at the moment it is assumed that the variables listed below will be used to construct a theoretical model and to explain the relationship between dependent variable - underpricing and firm specific factors.

Underpricing: First day trading return as measured by the offer price. Dependent variable.

Market capitalization: Market capitalization of the company during the IPO date.

Market return: Corresponding stock market return over 4 weeks period prior to the issue date. Either Riga, Tallinn or Vilnius will be taken as benchmark.

Turnover. First day trading turnover of IPO.

Proceeds: amount of money raised in the process of IPO.

Offer price: nominal price of IPO.

The relations between the dependent variable – Underpricing and all the remaining influencing factors, will be tested using and Ordinary Least Squares (hereinafter – OLS) method and analyzed using the GRETL software package.

Data Selection

Scope of the study. Although stock exchanges were established in all three Baltic countries in 1994, just after the first successful round of privatizations, it took them roughly 10 years to reach acceptable and comparable standards between all three exchanges in Riga, Vilnius and Tallinn. In 2004, all three countries accessed the EU, which in turn encouraged deeper integration of Baltic stock markets as all three countries' stock markets joined the NASDAQ OMX group. This step marked consolidation of Baltic stock markets, integration of infrastructure, removal of market access restrictions for foreign investors and deeper corporate governance for listed companies. (Darškuvienė, Keating & Žigienė, 2014).

Data collection. That is why in order to examine the IPOs behavior in Baltic stock market, a period of 11 years from 2004 to 2014 was taken. During this period 21 instances of equity

issuance was observed in the Baltics, while eight of these corresponded to secondary public offerings (SPO).

It is important to note that while a precise amount of IPOs during the period is known, all the relevant pricing data is not readily available, as not all investment prospectuses are available, most of them consists a possible price range for the issue, but not the final price and finally the presentation language in the prospectus is Latvian. Thus, although the data set that is needed for the study is not complicated and large, it is not readily available and underwriting banks must be contacted directly for this purpose. However, this hurdle signifies that the research might be usable in the future for informational purposes concerning the Baltic stock markets performance.

Further information about the companies and relevant pricing data was collected by contacting the underwriting banks directly and was coupled with information provided by the Nasdaq OMX online database and its Vilnius office. Firm specific data which will be used for the regression analysis will be collected from corresponding companies' annual financial statements as well as Nasdaq OMX database. Specific parameters that will be analyzed are discussed in detail in next section of the thesis.

Empirical Research Results and Discussion

The data collection stage was the most effort requiring part of this thesis. Due to the small equity market size in the Baltics, no sufficient statistical databases exist and manual data collection from different sources had to take place. All relevant pricing data (offer price) for the IPO process was collected by contacting underwriting banks directly, extracting material information from IPOs' prospectuses and marketing material and so far proved to be the most hard to get variable in the data collection stage. Nasdaq OMX Baltic Vilnius office was helpful in providing

some of the initial public offerings prospectuses and their summaries, however all the material was unfortunately in Latvian and a lot of documents had to be translated in order to be usable. Strangely enough, the historical search feature of Nasdaq OMX Baltic returned no results when looking for new issues (IPOs) in the market during the research period of 2004-2014. This led to the need to manually search for, extract and download all the secondary market data from the Nasdaq OMX Baltic website, using the historical search function for every single equity listing.

Morningstar database was used to extract firm specific parameters needed to conduct the IPO underperformance research part and construct benchmark portfolios for comparison with IPO companies. Again, historical data had to be extracted manually from individual reports generated by Morningstar for each new equity listing as well as all the remaining equity universe of more than 70 stocks.

The combination of the data acquired for the research of IPO underpricing and underperformance parts has allowed to produce a statistical sample, which was used to construct a multiple regression model, which was tested by using the GRETL software package.

The sections below will discuss each research part and its results in greater detail.

IPO underpricing. After conducting the primary data collection stage, 13 IPOs were identified in the Nasdaq OMX Baltic market during the period 2004-2014. 8 out of 13 new issues were floated on the Tallinn stock exchange, 4 appeared in Vilnius and only 1 new issue was floated in Riga during the whole 2004-20014 period. Although companies have a choice when going public on which trading list they want to be placed (depending on financials), only one company out of the whole sample was listed on the secondary trading list, while all other IPOs appeared on primary trading list. It is interesting to note that a great majority the IPOs appeared during the

period leading up to the 2008 crisis and then a small minority happened in 2010. This would seem to be in line with the empirical academic literature provided in the literature review section and indicates that IPOs in the Baltic may also exhibit cyclical behavior. Market capitalizations for the companies going public ranged from as low as 10 million Euros to as high as 861 million Euros, however the median market size of a company going public was found to be 97 million Euros. When comparing firm's market capitalization with the capital it raised during the IPO process, on average IPO proceeds are around 40% of the total market value. When taking into account the outliers in the data and measuring the median, the relationship drops to around 29% of the total market capitalization. Table 6 below summarizes all the general trend statistics discussed here.

Table 6.

Descriptive statistics of Baltic IPOs during the 2004-2014 period

Company name	***Country***	***List***	***Issue date***	***Market capitalization (€, mln)***	***Proceeds total (€, mln)***
Agrowill Group	Lithuania	1	4/2/2008	12,00	9,80
Arco Vara	Estonia	1	6/21/2007	138,00	84,00
City Service	Lithuania	1	6/8/2007	254,00	18,00
Eesti Ehitus (Nordecon)	Estonia	1	5/18/2006	163,00	18,80
Ekspress Grupp	Estonia	1	4/5/2007	89,00	36,10
Linas Agro Group	Lithuania	1	2/17/2010	97,00	28,00
Olympic Entertainment Group	Estonia	1	10/23/2006	667,00	71,80
Premia Foods	Estonia	1	5/10/2010	37,00	13,00
SAF Technika	Latvia	1	5/26/2004	36,00	23,81
Starman	Estonia	1	6/28/2005	10,19	12,10
Tallink Grupp	Estonia	1	12/9/2005	861,00	166,30
Tallinna Vesi	Estonia	1	6/1/2005	300,00	55,50
Vilkyskiu pienine	Lithuania	0	5/17/2006	15,44	1,40

Note: created by the author

In order to determine the existence and magnitude of the underpricing, the return formula discussed in research methodology was used. The formula measures underpricing with the issue price and the closing market price as well as subtracting the corresponding market index return during the day of IPO. The results for the underpricing study in Nasdaq OMX Baltic during the 2004-2014 period are summarized in Table 7 below.

Table 7.

Underpricing results of Baltic IPOs during the 2004-2014 period

Company name	***Issue price (€)***	***Closing price (€)***	***Daily market return (%)***	***First day turnover (€, mln)***	***Underpricing (%)***
Agrowill Group	1,45	1,45	0,43	0,14	-0,56
Arco Vara	2,43	2,37	0,48	7,46	-2,95
City Service	3,75	4,07	0,00	1,16	8,59
Eesti Ehitus (Nordecon)	5,75	6,07	-1,35	3,16	6,92
Ekspress Grupp	5,90	7,10	0,00	8,80	20,34
Linas Agro Group	0,59	0,59	-0,35	0,34	-1,11
Olympic Entertainment Group	4,67	5,60	-0,02	5,32	19,93
Premia Foods	0,89	0,90	3,72	0,08	-2,60
SAF Technika	49,80	56,28	0,00	0,01	13,02
Starman	3,35	3,98	0,02	1,07	18,79
Tallink Grupp	5,27	5,31	0,06	8,56	0,70
Tallinna Vesi	9,25	10,60	-0,03	9,87	14,62
Vilkyskiu pienine	1,52	1,56	0,49	0,19	2,37

Note: created by the author

The average underpricing during the study period was found to be 7.54% with a standard deviation of 8.91%. The median of the sample was found to be 6.92%. Since the median is lower than the average, it indicates that the sample is skewed to the right with large positive outliers. The testing of the sample against normal distribution also revealed that the mean is significantly different from zero. The result of this study is significant not only statistically, but also in

theoretical terms as well, as from this point forward, the IPO activity in the Baltics can be directly compared to various markets around the world, since the methodology used in measuring underpricing was consistent with previous studies done by Ritter (2014), Cao & Wen (2013) and Dietrich (2012). Further discussion of the results will be carried out in the next section, however it is possible to note already that the magnitude of underpricing makes Baltic markets comparable to other developed nations.

A similar analysis was done for the IPOs from Baltic companies floated in Warsaw Stock Exchange, Poland. The results are summarized in Table 8 below.

Table 8.

Underpricing results of Baltic companies IPOs in WSE

Company name	***IPO date***	***Issue price (PLN)***	***Closing price (PLN)***	***Daily market return (%)***	***Underpricing (%)***	***Proceeds total (PLN, mln)***
AviaAM Leasing AB	6/28/2013	8	8,3	2,47	1,28	30,00
AB Inter RAO	12/18/2012	24,17	25,75	0,78	5,75	96,68
Avia Solutions Group	3/3/2011	52	55,15	1,50	4,56	76,61
Agrowill Group	7/8/2011	1,14	1,2	-0,73	5,99	15,13

Note: created by the author

Unfortunately, the research was only able to gather IPO data from 2011 onwards, thus only 4 out of 6 Baltic IPOs were captured in this analysis. Two Estonian companies (Olympic Entertainment Group AS, AS Silvano Fashion Group) that issued their shares on WSE in 2007

are not represented in this study. The remaining four companies are Lithuanian. It is interesting to note, that all Baltic IPOs that were floated on WSE coincided with the time period when IPO activity stopped in the Baltics. Thus an argument can be made, that after the financial crisis period, companies found it convincing to choose WSE over Nasdaq OMX Baltic. Even though, the issue and closing prices are given in Poland's national currency and not Euros, this does not raise an issue for our research, since the research is estimating a percentage difference between the two prices.

The average underpricing figures together with standard deviations was compared between Nasdaq OMX Baltic and Warsaw Stock Exchange. The results can be seen in Table 9 below.

Table 9.

Comparison of average underpricing between Warsaw Stock Exchange and Nasdaq OMX Baltic

	***W*arsaw Stock Exchange**	***Nasdaq OMX Baltic***
Average underpricing	4,39 %	7,54 %
Standard deviation	1,88 %	8,56 %

Note: created by the author

Baltic companies that were floated on WSE on average experienced a 4.39% underpricing with a standard deviation of 1.88% while companies that were floated on Nasdaq OMX Baltic experienced a much larger 7.54% underpricing with an 8.56% standard deviation. While the underpricing between the two markets differs considerably, standard deviations are even more far apart. While WSE appears to be uniform in its underpricing figures as indicated by its standard deviation, underpricing on Nasdaq OMX Baltic ranged from 0% to just over 20%. However, this cannot serve as a direct comparison due to the fact, that only four companies are analyzed on WSE. Another interesting analogy can be made by looking at Agrowill Group

company that was floated on both exchanges with very similar issue sizes. When floated on Nasdaq OMX Baltic in 2008 Agrowill Group experienced almost no underpricing at all, and when it was floated on WSE in 2011 it was underpriced by 5.99%.

The existence and magnitude of underpricing of initial public offerings in the Baltic stock market was an integral part of this thesis' main research question. As shown in the empirical results section above, the phenomena of underpricing does indeed exist in the Baltic stock market as well as its separate component markets in Riga, Tallinn and Vilnius. Furthermore, it was demonstrated that Baltic companies had experienced underpricing when issuing their shares on Warsaw Stock Exchange as well. It may be arguable that the Baltic market is very peculiar compared to other global markets and could even be called fragmented due to the fact that it is connecting three different countries into one not always uniform system. However, these peculiarities and differences only stands to better reinforce the general hypothesis revealed in the literature that IPO underpricing is a universal phenomenon that can be found in different countries, between different market structures and also in different economic development levels. Looking to data, provided by Ritter (2014), it is clear that the IPO count that occurred in the Baltic region is one of the lowest in the world, with only Bulgaria being smaller in that regard with 9 observations, while Baltic's closest bigger contenders would be Argentina with 26 observations and Tunisia together with Portugal, both having 32 observations. However, when analyzing and comparing the Baltic stock market with other countries in terms of underpricing levels, Baltic region falls in between completely different countries than before. Taking the calculated average underpricing figure for the Baltics of 7.54% from the empirical research section, five closest comparing countries would be Austria with 6.4%, Canada with 6.5%, Chile with 7.4%, Denmark 7.4% and Norway with 8.1% in average first day initial returns for the IPOs

(Ritter, 2014). This is an interesting group of countries in that respect that many of these can be characterized as being "rich" countries with extremely well developed economics and social systems as well, while Chile has been called an economic miracle in the past, due to its rapid and well-structured transformation into a market led economy. While it may appear Baltic market system should deserve some attention because of exhibiting a similar behavior to one observed in well-developed rich economies, it must be reminded that the Baltic underpricing figures come from a very small sample of IPO events. Investigating the relating factors between countries or markets exhibiting a similar IPOs' behavior and underpricing level would be an interesting and maybe even fruitful future research possibility, which would require a thesis size research on its own. However, it should be noted that these underpricing numbers detailed above represent studies done during varying time periods and in order to provide a statistically correct analysis and interpretation, uniform time series analysis should take place between the countries.

Furthermore, stemming from the author's Lithuanian experience and observations that Lithuanian population is not knowledgeable and generally not interested, in some cases even distrustful of the stock market, it seems to signal that public perception of IPOs and even involvement in the trading of some of the big issues, might add some weight to the argument recurring in the academic field, that eager retail investors might bid up the price of IPO during the first day of trading if that IPO has been a focus of major financial news event or public enthusiasm about the new issue in general. This piece of statistics from the Baltic market could further reinforce the hypothesis that the bigger the fuss about the company going public, the bigger its underpricing.

Another interesting angle that needs discussion in this section is the possibility to analyze the Baltic market not as a whole united system of markets, but as separate markets, operating in

three different Baltic countries. Since it appears, that the biggest nominal underpricing of stocks occurred in Estonia, it could further test the previous presupposition that public's interest in the stock market and amount of equities held by the public positively correlates with general magnitude of underpricing. However, once again to provide a statistical comparison, more independent data points would be needed.

IPO underperformance. In order to test the sample for underperformance, at first market capitalization data of all listed companies was gathered from Nasdaq OMX Baltic equity universe. Although, some authors like Gur-Gershgoren, Hughson & Zender (2008) recommend using book-to-market ratios in addition to market capitalization to better match similar companies for comparison purposes, this was not possible in the Baltics case, since historical book-to-market data is not readily available in any statistical database covering this region. Table 10 details market capitalization figures for each company. New issues are separately marked in red.

Table 10.

Market capitalization (€, mln) of companies listed in Nasdaq OMX Baltic during the period 2006-2014

Company name / Year	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*
Apranga	466	506	76	152	115	80	118	144	145
Baltika	138	73	21	14	31	11	21	22	19
Grigiskes						28	33	46	64
Grindeks	69	53	31	36	64	41	44	61	62
Harju Elekter	70	57	17	35	51	38	46	47	49
Invalda	541	730	71	78	103	100	102	79	37
Latvijas kugnieciba	214	260	132	80	74	62	50	79	72
Lesto						338	364	471	603
Lietuvos dujos	1787	1656	605	985	342	281	262	181	189
Lietuvos energijos gamyba						237	242	250	495
Merko Ehitus			50	89	160	96	104	127	126
Olainfarm	28	33	5	13	31	35	52	70	84
Panevezio statybos trestas		255	25	62	32	18	15	18	14
Pieno zvaigzdes	293	314	111	159	75	86	88	93	77
Rokiskio suris						47	50	56	48
Siauliu bankas	425	556	168	202	69	58	58	66	72
Silvano Fashion Group	149	176	20	31	108	121	108	105	46
Skano Group	14	8	4	3	6	7	6	5	4
Tallinna Kaubamaja	374	318	85	147	253	196	223	216	208
Teo			945	1422	557	466	597	596	577
Utenos trikotazas						4	4	5	3
Ventspils nafta	246	232	73	98	146	125	112	104	118
Vilniaus baldai	70	85	47	35	37	40	55	54	59
Agrowill Group						12	12	17	37
Arco Vara		138	16	16	26	10	7	7	5
City Service		254	65	123	89	62	59	57	53
Ekspress Grupp		89	15	21	46	31	32	34	34
Linas Agro Group					97	64	91	108	109
Eesti Ehitus (Nordecon)	163	151	31	49	43	28	36	32	33
Olympic Entertainment Group	667	529	74	116	225	16	269	281	258
Premia Foods					37	25	25	25	26
SAF Tehnika	36	3	1	1	9	5	4	5	5
Tallink Grupp	861	708	256	248	529	358	582	596	452
Tallinna Vesi	300	259	180	200	158	126	184	238	262
Vilkyskiu pienine	15						15	19	24

Note: created by the author

Although, the scope of the underpricing research covers the period of 2004-2014, data needed for the underperformance part was only available for the period of 2006-2014. This presented a methodological challenge when dealing with 4 IPOs which were floated before 2006 (SAF Tehnika, Starman, Tallink Grupp, Tallina Vesi). In order to overcome this shortcoming, performance of these 4 IPOs were measured from 2006 onwards. While not entirely accurate, this could only potentially raise an issue with only one company – SAF Tehnika, since its equity was issued to the public in 2004, while the rest of the remaining 3 companies floated their issues close to 2006 as can be seen from the issue dates.

As can be seen in Table 10, 12 companies are marked in red as new issues instead of original 13 which were identified in the first part of the thesis dealing with underpricing phenomena. Starman AS was delisted from Tallinn Stock Exchange on January 22, 2009 by satisfying the application made by Starman AS main shareholder Baltic Monotech Investments Holding AS and allowing to takeover the shares from the minority shareholders by providing a fair monetary compensation (Tubalkain-Trell, 2009). The removal of Starman from this analysis allowed to carry out unaltered analysis as was planned and detailed in the research methodology section. Although, it may introduce some form of survivorship bias into our analysis, this will not be significant as Starman AS represented only a small fraction of the total market.

After completing data gathering and processing, the whole equity universe was ranked according to its size as measured by market capitalization. In order to construct benchmark portfolios, IPO company's size as measured by market capitalization during the year of the share issuance was compared to the whole equity universe and three closest size matching companies were selected for comparison. This procedure was repeated for every IPO companies with separate that particular year based size rankings. It can be noted that the median size of a company on the

Baltic primary trading list rose from 36 million Euros in 2006 to 66 million Euros in 2014, which signifies a general trend of growing company size as well as the corresponding market size in general.

To compare the performances of these companies, historic return data was gathered for all companies during the period of 2006-2014. It can be seen presented in Table 11 below.

Table 11.

Yearly returns (%) during 2006-2014 period

Company name / Year	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***
Apranga	33	10	-84	27	160	-26	54	30	6
Baltika	29	-13	-63	47	73	-24	38	11	-8
Grigiskes	-17	-7	-85	209	190	-40	20	30	41
Grindeks	4	-24	-42	17	76	-35	7	38	-28
Harju Elekter	4	-15	-67	116	48	-23	19	6	7
Invalda	-9	39	-89	10	273	-2	1	75	-10
Latvijas kugnieciba	-18	2	-50	-40	-7	-16	-18	53	-35
Lesto							22	38	49
Lietuvos dujos	-1	-6	-60	70	27	-8	1	35	35
Lietuvos energijos gamyba							2	7	124
Merko Ehitus				87	94	-39	9	27	5
Olainfarm	24	-4	-84	146	131	16	53	320	-15
Panevezio statybos trestas	8	4	-89	157	80	-43	-15	22	-24
Pieno zvaigzdes	24	11	-61	49	82	24	14	14	-13
Rokiskio suris	-26	44	-77	73	-42	-23	10	16	-11
Siauliu bankas	9	-11	-69	20	4	-27	-6	23	8
Silvano Fashion Group	75	12	-88	53	256	14	-2	1	-45
Skano Group	14	-39	-53	-8	100	13	-24	-2	-30
Tallinna Kaubamaja	-58	-14	-72	75	73	-22	21	3	-1
Teo	8	-5	-40	77	47	-9	38	7	36
Utenos trikotazas	-25	-19	-72	-18	-67	-41	-12	33	-42
Ventspils nafta	-13	-6	-69	102	49	-13	-11	-8	-20
Vilniaus baldai	-47	22	-46	-25	5	22	66	-1	46
Agrowill Group				-94	176	-46	-3	44	-1
Arco Vara			-61	0	3141	-96	-23	-11	-41
City Service			-73	93	51	-27	-2	-3	-5
Ekspress Grupp			-83	30	48	-33	3	9	1
Linas Agro Group						-33	43	22	2
Eesti Ehitus (Nordecon)		-6	-75	61	-12	-36	29	-10	4

Olympic Entertainment Group		-59	-85	57	93	-29	68	10	-3
Premia Foods						-32	2	11	-3
SAF Tehnika	4	-90	-61	54	550	-34	-12	15	-17
Tallink Grupp	3	-80	-64	-3	114	-28	51	9	-21
Tallinna Vesi	15	-10	65	19	-5	-20	60	39	18
Vilkyskiu pienine		21	-88	299	156	-26	9	33	33

Note: created by the author

Several performance sub periods are visible when analyzing the results detailed in the Table 11. Year 2006 and 2007 marked a stable period, not characterized by steep returns, instead the median return in the market was 3.8% and -5.6% respectively for year 2006 and 2007. However, 2008 was the year when the financial crisis started affecting the Baltic countries. This can be clearly seen in the individual stock returns during the year 2008 as well as the general market return for that period. The median return for stocks listed on the Nasdaq OMX Baltic primary trading list during 2008 was -69 percent. In addition to that, interestingly enough, the average returns for the same stocks in 2008 in Nasdaq OMX Baltic was -64.97 percent. The relatively small difference between these two measurements signifies that the market suffered a decrease in value as a whole, due to external circumstances and not because of the performance of individual securities. The two years (2009 and 2010) coming after the significant drop in all market values in 2008 proved to be very lucrative for the investors and provided them with steep returns. The mean and median returns in 2009 were 56.90 and 52.90 percent respectively. This again hints at a movement most likely by a change in a general market sentiment or global circumstances affecting the whole rather than the returns of individual securities. 2010 on the other hand, was even more successful than the previous year, but this time the larger part of this success can be attributable to the performance of individual companies. Median return for 2010 was 76.3

percent, while the mean stood at 193.28 percent indicating a large right hand skew or outlier companies with large positive returns which significantly influenced the performance figures of our sample as well.

These historic market tendencies could also be connected to the situation developing in the Baltics as the timing coincides with the real estate bubble and the general recession experienced in all three Baltic countries. While the period from 2000 to 2006 was marked by a stable and relatively strong economic growth, real estate markets entered into a price correction period by mid-2007 in Estonia and mid-2008 in Latvia and Lithuania (Deroose, Flores, Giudice & Turrini, 2010). Subsequently, all countries experienced a recession by mid-2008 and started to show signs of recovery in 2010 both in GDP growth and in terms of increases of different real estate indexes in Estonia, Latvia and Lithuania (Deroose, Flores, Giudice & Turrini, 2010). Furthermore, the stock market's performance can be cautiously compared to the claims made by some economists and the media about the possible double dip recession in Europe during that period (O'Brien, 2013).

As some companies experienced double or triple digit returns or even as in the case of Arco Vara, a four digit return in 2010, the stock market experienced a correction in 2011. The returns for the year 2011 was estimated to be -26.3 percent as measured by the median and -21.44 percent in average return terms. Again, the similarity of these two measures provides some evidence that could be used to argue that some general market trend was guiding the stock market's returns during the year 2011. After the correction in 2011, in 2012 the Baltic market primary trading list entered into a growth phase again, with median returns at 8.5 percent and average returns at 14.64 percent. This growth trend continued and in 2013, the market reported growth figures equaling to 15.4 percent return as measured by the median and 26.98 percent as

measured by the average. However, while 2013 was also overall one of the most successful year for the other global equity indexes, such as S&P 500, their growth continued in 2014 as well (Park, 2013), whereas the Baltic primary trading list produced marginal performance at best, with returns equaling to -2.9 percent as measured by the median and 1.22 percent as measured by the average.

After obtaining all the return data for individual companies, reference portfolios were constructed for each new issue. These portfolios consisted of stocks of 3 closest matching companies and their 1 year and 3 year performance figures were recorded and equally weighted to estimate the end result for the portfolio performance. Finally it was compared to the relative IPO company's long term performance against which the portfolio was constructed. The results for both 1 year and 3 year performance of IPOs and their relative benchmark portfolios are shown in Table 12 below. New issues that were later included in the portfolio construction process are marked in red.

Table 12.

IPOs vs Benchmark portfolios long term performance

Event company	***1year return***	***3 year return***	***Control group***	***1year portfolio return***	***3years portfolio return***
Agrowill group	-93,70%	75,62%	Skano group Olainfarm Ekspress Grupp	56,37%	232,28%
Arco Vara	-61,40%	1251,10 %	Ekspress Grupp Eesti Ehitus (Nordecon) Silvano fashion group	-82,27%	-56,29%
City service	-73,20%	-21,78%	Ventspils nafta Panevezio statybos trestas Tallinna Vesi	-30,80%	10,73%
Eesti Ehitus (Nordecon)	-5,50%	-62,37%	Latvijas krugnieciba Silvano fashion group Baltika	6,73%	-65,38%
Ekspress Grupp	-83,10%	-67,32%	Baltika Vilniaus baldai Harju Elekter	-58,53%	-19,36%
Linas Agro Group	-33,40	16,23%	City service Invalda Silvano fashion group	-5,27%	1,91%
Olympic Entertainment Group	-59,20%	-90,45%	Apranga Invalda Tallink Grupp	-10,20%	-84,21%
Premia Foods	-31,60%	12,67%	Panevezio statybos trestas Vilniaus baldai Eesti Ehitus (Nordecon)	-18,97%	11,29%
SAF Tehnika	3,80%	-96,06%	Skano group Olainfarm Grindeks	14,07%	-67,32%
Tallink Grupp	3,00%	-92,36%	Apranga Invalda Olympic Entertainment Group	6,80%	-85,24%
Tallinna Vesi	15,00%	72,14%	Venstpils nafta Pieno zvaigzdes Tallinna Kaubamaja	-15,63%	-70,09%
Vikyskiu pienine	21,10%	-40,08%	Olainfarm SAF Technika Grindeks	-39,37%	-68,23%

Note: created by the author

However, before the measurement of buy and hold abnormal returns (BHAR), it was important to test the returns of individual companies against the returns of the benchmark portfolios in order to make sure that they differ significantly from each other. This was done by carrying out a conventional t-test. The results can be seen in the Table 13 below. One particular company – Arco Vara was considered an outlier due to its extremely high return (1251.1% 3 year return) and was excluded from the calculations as it would negatively influence the overall representativeness of our small sample.

Table 13.

The t-test results for Buy and Hold Abnormal Returns (two sample assuming unequal variances)

	1 year IPO	***1 year portfolio***	***3 year IPO***	***3 year portfolio***
Mean	-0,331	-0,147	0,79	-0,216
Variance	0,163	0,129	13,9697	0,771
tStat	-1,179		0,912	
P (T<=t) one tail	0,125		0,189	
T critical one-tail	1,717		1,782	
P (T<=t) two tail	0,250		0,378	
T critical two-tail	2,073		2,178	

Note: created by the author

Unfortunately, as can be seen from the p-values in the Table 13, both 1-year and 3-year IPO returns were not statistically different from the returns of the benchmark portfolios. This is a limitation of this study that may be solved when larger data samples can be gathered.

Buy and Hold Abnormal Returns were calculated by using the return figures above together with the calculation methodology described in the research methodology section. The BHAR results are presented in Table 14 below.

Table 14.

BHAR return

	1 year	*3 years*
BHAR*	-3,62%	-0,08%

Note: created by the author

*Arco Vara counted as an outlier and excluded from the analysis

As can be seen from the Table 14 above, the Buy and Hold Abnormal Returns (BHAR) was negative for both 1 year and 3 year returns. During the 1 year holding period, IPOs tend to underperform their size matched portfolios by -3.62% and during the 3 year measurement period the IPOs underperform the same portfolios by -0.08%. These findings are in line with the current literature about IPO aftermarket performance as Ritter (2014) in its analysis of the USA IPO market had concluded that the underperformance for size matched portfolios was equal to -4.4% during the first year and -3.4% during the 3 year holding period.

Interestingly, Ritter (2014) obtained very similar figures to this thesis' results when constructing portfolios on size and book-to-market criteria. Using this type of measurement, the results were -3.8% underperformance during the first year and 0% underperformance during the 3 year holding period.

These results indicate that Baltic equity market investors should be aware that while IPOs provide high first day returns, their subsequent aftermarket performance is below par when compared to similar size matched companies.

IPO underpricing influencing factors in Baltic stock market. In order to provide a statistical explanation for the underpricing phenomena observed in the Baltic stock market during the

period of 2004-2014, regression analysis was used. The procedure of the regression analysis included all the necessary steps detailed in the research methodology section, holding underpricing as the dependent variable and regressing it against other independent variables. After a series of tests and changes in the model specification, the working model contained 6 other independent variables (proceeds, turnover, market return, market capitalization, offer price, age). However, the first model that was obtained did not provide sufficient statistical power as the "Age" variable was not statistically significant and thus needed to be omitted in order to provide a better fit for the model. The initial model was revised to exclude the "Age" variable. After the revision, the model's statistical explanatory power improved significantly. Furthermore, one company – Starman AS had to be omitted from the regression analysis since it was delisted from the Nasdaq OMX Baltic primary trading list not long after its listing. While this further suppressed the already small sample size, now reducing it to 12 observations, the improved and revised model can be seen in Table 15 which details model output results together with the regression equation obtained from GRETL (Appendix no 1) software running an Ordinary Least Squares (hereinafter - OLS) test.

Table 15.

Regression analysis

	B coefficent	***Standart error***	***t-ratio***	***p-value***
Constant	0,04708	0,021	2,145	0,075
Proceeds	-0,00382	0,000	-3,987	0,007
Turnover	0,16246	0,064	2,534	0,044
Market	0,73020	0,350	2,084	0,082
Market capitalization	0,00037	0,000	3,569	0,011
Offer price	0,00346	0,001	3,414	0,043

Note: created by the author

Regression equation:

$$Underpricing = 0.0471 - 0.00382*Proceeds + 0.162*Turnover + 0.730*Market + 0.000377*Market\ capitalization + 0.00346*Offer\ price \quad (3)$$

In general, all the variables used in the model are statistically significant with all p-values at least below 10%, while some values are showing even a greater unlikelihood of being insignificant. This is illustrated in Appendix No 1 by the "*" symbol next to each variable, where one star indicates statistical significance within a 10% confidence interval, two stars represent statistical significance within a 5% confidence interval and three stars represent statistical significance in a 1% confidence interval. In addition to the independent variables being statically significant, the model itself is statistically significant as measured by the F-test and its corresponding F-value. Another important criteria pointing out the model's positive side is its adjusted R-squared of 67.7%, since it is an unbiased estimator of how well the model is doing at explaining the variance, while at the same time taking into account the number of variables used and also the number of observations in the sample.

In this case, our obtained model is able to explain a high percentage of total variance in the sample and according to Frost (2013), models with R-squared in the upper 70s are usually indicative of a good fit and are deemed acceptable for statistical analysis, however, while being an intuitive measure of the model's fit, R-squared should be examined in accord with other statistical model representations, such as residual plots, which will be discussed later on.

Three main diagnostic tests were carried out with the model in order to ensure the soundness of it – the test for normality, White's test for heteroscedasticity, Ramsey Regression Equation Specification Error Test (RESET) test for specification and a standard test for collinearity. When tested against the normal distribution, the residuals in the model proved to be normally distributed, further increasing the goodness of fit and allowing the usage of conventional statistical tests assuming Gaussian distribution. White's test for heteroscedasticity revealed that there are no existing sub-populations that would have different variances as compared to the overall sample variance, thus the sample was concluded to be homoscedastic, which ascertain the validity of the results in the model's analysis. RESET test further strengthened the model's statistical backing by indicating that non-linear combinations of the independent variables do not increase the explanatory effect of the dependent variable, thus indicating that the model is correctly and adequately specified. Finally, a test for collinearity was also carried out, which results are depicted in Appendix No 2 and in the Table 16 below.

Table 16.

Collinearity test results

	VIF
Proceeds	9,009
Turnover	6,217
Market	1,231
Market capitalization	3,790
Offer price	1,109

Note: created by the author

As can be seen from the output, the model does not contain any variable that is highly correlated with any other variables and consequently cannot be predicted from the others. However, it should be noted that as can be seen from the software output, variable Proceeds is a borderline case, that could pose a problem if we would like to use the model for predicting future behavior.

To reveal the performance of the model further, Figure 4 and Figure 5 below depicts the distribution of the regression residuals for the underpricing variable and also shows how well the model would predict the observed variables.

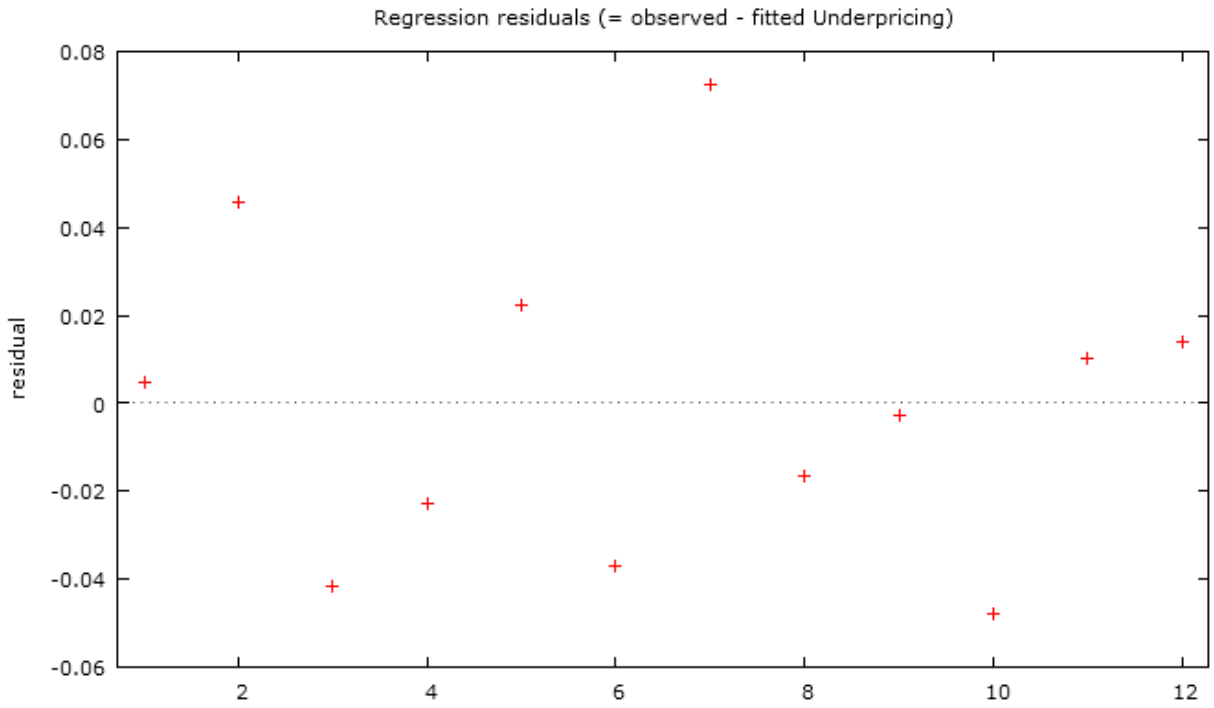

Figure 4. Regression residuals (GRETL output).
Note: *created by the author*

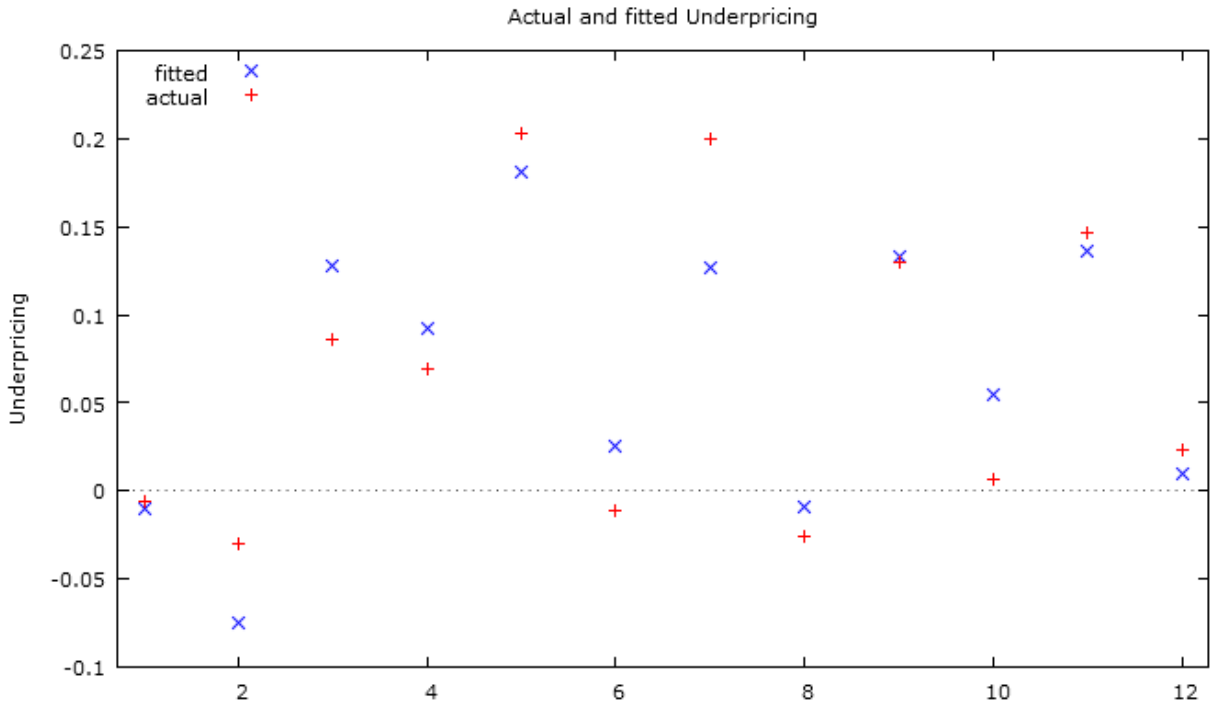

Figure 5. Actual vs fitted values (GRETL output)
Note: *created by the author*

Although it must be admitted that the model lacks observations in order to successfully predict future events using the independent variables, it would still be interesting to test the models performance during the next IPO in the Baltics.

While all these procedures are purely statistical exercises that cannot prove anything per se, their positive results about the model increase the likelihood of success of the experiment.

Even though as stated before all the variables are statistically significant and all the statistical testing only increased the significance of the model by providing positive results, the model can also be evaluated purely on the logic and economical soundness of the model's results. In our case, the model shows that underpricing (Underpricing) and its magnitude are proportionally related to first day turnover (Turnover), market capitalization (Mcap), corresponding stock

market return four weeks before the sale of IPO in the market (Market) as well as offer price (Oprice) at which the new issue was sold. At the same time, the model finds that underpricing (Underpricing) is inversely related to the amount of money raised during the sale of IPO (Proceeds). As discussed in the literature review section of this thesis and also extensively covered by Boudriga, Slama & Boulila (2009), the models results can be compared to theoretical assumptions made before and findings made by other authors.

When looking at the results about the relation between underpricing and offer price, the empirical findings from the model suggest that the increased offer price leads to increased levels of underpricing. These conclusions are in line with evidence previously reported in the literature by Boudriga, Slama & Boulila (2009) and Daily *et al.*, (2003), both of which argue that higher prices are associated with more stable firms and lower future uncertainty about their performance. In addition to that, as discussed before, higher prices attract institutional investors, which needs to be compensated for revealing the valuable information about the pricing of the new issue (Gompers and Metrick, 1998).

Size of the issuing firm as represented by market capitalization proved to be directly influencing the degree of underpricing. In other words – the bigger the company, the larger is the underpricing of its IPO. However, the empirical evidence found in this thesis actually opposes the previously discussed theories that were provided in the literature. The model that was tested in this thesis seems to disagree with authors such as Boudriga, Slama & Boulila (2009), Kiymaz (2000) and Ibbotson, Sindelar & Ritter (1994), who argue that larger firms are inherently less risky, because they are usually better diversified in their business activities, have a better access to various financial resources and capital and in addition to that are better monitored. All of this jointly reduce the uncertainty faced by investors when choosing possible future investments and

thus reduces the underpricing. The disagreement between the empirical evidence in the literature and this thesis research results may arise due to the statistical nuances of model's small sample of data or because of the peculiarities of the Baltic equity market and issuance process. On the other hand, principal-agent theory can be used in arguing that larger companies tend to have ownership structures where principal and agent relationships are more widely spread within the company as discussed by Jungqvist & Wilhelm (2003). Furthermore, this may be linked to an empirical research provided by Genyte and Saltinis (2011), where research findings explicitly indicate that insider trading is existing in the Baltic countries and can be usually spotted around large corporate events, such as earning announcements, etc. Further evidence suggest that informational advantage is used to produce abnormal returns around these times by informed insiders. In addition to that, Genyte and Saltinis (2011) notices that higher liquidity of a company is an important criteria for determining the magnitude of abnormal returns extracted by insider purchases. This reasoning could also be applied to initial public offerings and our specific case, as larger (more liquid) companies could in effect be more susceptible to insider trading that may exploit initial public offering as a possible proxy for the creation of abnormal returns, however such deductions are useless without further statistical analysis. Nevertheless, it is still an interesting point for discussion and could be analyzed further.

Another size parameter included in the model was the total gross cash proceeds from the IPO offer (Proceeds). The model showed that this particular parameter is negatively related to underpricing, or in other words, the more money a company can raise during its IPO, the less likely it is to experience underpricing when introducing its share to the public stock market. This result is actually in line with the empirical evidence and reasoning supplied in the literature analysis section as total gross proceeds obtained during the shares issuing process is supposed to

be negatively related to the level of underpricing. As explained by Boudriga, Slama & Boulila (2009), this relation stems from the theory that larger offerings tend to be supplied by bigger and more well-known companies, which can already provide the market with several years of operating data and a proven business model. This helps to reduce the level of underpricing in the stock market as the perceived risk in the company is reduced in the eyes of potential investors. Empirically, this has been one of the strongest relation observed by the IPO underpricing literature in the USA market (Clarkson & Simunic, 1994). The Baltic market have proved to be similar in that respect as the p-value for the Proceeds variable was the lowest of all the variables in the model and stood at 0.0072 or below 1% confidence interval, indicating a very strong statistical significance.

While all these variables directly dealt with measures attributable to the company itself, the remaining two variables, which were the 4 week corresponding market return leading up to the IPO (Market) and the IPO trading turnover during the first day of trading (Turnover), dealt more with the trading patterns observed in the market. The Market variable was positively related to the IPO underpricing variable, indicating that the general market return 4 week prior to the IPO issuance date most probably indicates general market sentiment which influences all trades happening in the market during that time, with IPO events being no exception. However, the Market variable was only statistically significant at 10% confidence interval, with a p-value of 0.0822, which was not as statistically significant as all other variables in the model. According to the framework of Benveniste, Lawrence & Spindt, (1989), which later became the foundation for the work of Bakke, Leite & Thorburn (2012), IPO underpricing is related to the publicly available information in the stock market through two opposite mechanisms. First mechanism is called the incentive effect, whereby already existing market wide information can affect the

underpricing of a particular IPO when an investor is required to "truthfully report positive private signals" (Bakke, Leite & Thorburn, 2012). When negative market sentiment is present, the likelihood of receiving an allocation in an IPO is higher if the investor chooses to report false private signals. Consequently, investors are seeking a higher compensation in the form of underpricing in order to reveal positive pricing information when the general sentiment in the market is bad (Bakke, Leite & Thorburn, 2012). The second pricing mechanism is called the demand effect. Since both public and private signals ten to be correlated, the probability for investors to receive a positive private pricing signal is a lot higher when the general mood in the market is positive. And since investors are more likely to have positive price signals in good times rather than in bad times, the issue is more likely to become underpriced during good times (when market return pre IPO is positive and high). Bakke, Leite & Thorburn (2012) argue that the pre-IPO market return can either be positively or negatively related to the underpricing, depending on which of the two effects is dominating. Furthermore, authors have noted in their research that if the investor base is sufficiently large for the new public offering, the demand effect should be dominating. Since it was shown in the model provided by this thesis that the underpricing and pre-IPO market return are positively related, it should also be true that the demand effect is dominating in the Baltic IPO market and consequently on average a sufficiently large base of investors are channeling their money into IPOs.

When looking at the first day trading volume, the model's results are indicative of that it should be positively related with the first day underpricing. This has also been shown to be true by Yüksel & Yüksel (2006) in their work linking trade volume to IPO underpricing. The reasons behind this behavior are not concrete and are more of a speculative type. However, it could be hypothesized that speculative behavior by market participants during the day of the IPO could be

the culprit which leads to the increased magnitude of IPO underpricing. As IPO underpricing phenomena is a widely known and reported in other capital markets, Baltic stock market participants may speculate during the first day of trading expecting to capture some of the first day pop. J. Ritter who extensively studies the IPO market in USA had also claimed that if a trading pattern does exist during the first day of trading, sophisticated market participants, such as hedge funds tend to change their behavior accordingly in order to exploit the pattern and by doing so increase their monetary gain (personal communication, November 13, 2014). Whether or not this is the case in the Baltics and whether or not market participants are sophisticated enough to find and exploit such trends is a question that needs to be analyzed separately. In order to look into this in more detail, a separate research could be carried out if sufficiently deep market pricing data and order books are available for research purposes.

Conclusions

Initial public offerings have captured investors' and academic researchers' attention long time ago. While the first group was thrilled by the assumingly superior returns IPOs offered and was continuously looking for ways to secure an allocation of the "hot" issues, the second group was focused on the likely explanations behind the high first day returns of IPOs, which was labeled IPO underpricing.

Extensive literature review of the subject uncovered that IPO underpricing is a ubiquitous phenomenon that was documented in all types of equity markets around the world covering all industries and time periods. However, such a well-documented phenomena proved to be hard to explain as researchers up to this day cannot provide an exclusive theory on the subject. Some studies had attribute IPO underpricing to the actions of the equity issuing firm and the

underwriting bank while others claimed that the responsibility lies within overly eager investors. Furthermore, documented empirical studies had shown that the high first day returns of new issues are usually followed by an aftermarket underperformance when compared to a benchmark composed of companies with similar characteristics.

As no research examining the new issues behavior was conducted in the Baltics, Nasdaq OMX Baltic equity market was chosen as a test subject. Due to the fact, that the market contains three countries (Estonia, Latvia and Lithuania), a time period of 2004-20014 was chosen for the analysis as all three countries accessed the European Union on 2004 and equaled their respective rules and regulations to join a united equity market system. Furthermore, Warsaw Stock Exchange was also analyzed within the same time period, knowing that a handful of Baltic companies have floated their equity issues on WSE.

The research had concluded that IPO underpricing is existing in Nasdaq OMX Baltic equity market with Baltic companies issuing their equity on WSE also affected by IPO underpricing as well. The average IPO underpricing on Nasdaq OMX Baltic during the period 2004-2014 was estimated to be 7.54% with a standard deviation of 8.56%. The average IPO underpricing for Baltic companies listed on WSE was estimated to be 4.39% with a 1.88% standard deviation. This may possibly illustrate that WSE can be a more stable market for companies to float their issues and potentially explain why after the recent financial crisis all Baltic companies floated their new issues on WSE rather than Nasdaq OMX Baltic.

After the existence of IPO underpricing in Nasdaq OMX Baltic was established, a regression analysis was conducted which tested IPO underpricing against five other independent variables – firm’s market capitalization, IPO proceeds, offer price, first day trading turnover and recent

market movements. It was established that all the variables as well as the model itself are statistically significant and the model provided adjusted R-squared of 67.72%. The model suggested of an existing positive relation between the IPO underpricing and firm's market capitalization, offer price, first day trading turnover and recent market movements. A negative relationship was established between IPO underpricing and IPO proceeds, which was also the most statistically significant variable at 1% confidence interval.

Subsequently, IPO aftermarket performance was evaluated by constructing benchmark portfolios made out of three equally weighted companies that were matched by size to the issuing company. The performance of both groups was compared by using the buy and hold abnormal return (BHAR) methodology with 1 year and 3 year measuring periods. It was estimated that IPOs tend to underperform their benchmark portfolios by -3.62% during the first year and by -0.08% during the 3 year measuring period. The obtained aftermarket performance results proved to be similar to the figures obtained from empirical research in the USA equity market.

The research proved to be successful in all three parts (underpricing, influencing factors and underperformance) that it aimed to cover, however the research was mainly limited due to the small sample size of IPO companies in the Baltics. These limitations could be removed in the future if more new issues are introduced to the Nasdaq OMX Baltic equity market. Furthermore it is the author's belief that future research should involve a more detailed evaluation of the IPO issuing process and the techniques used by the underwriting bank to price the new issues as these factors could provide more evidence about the possible causes of IPO underpricing. This belief comes from the empirical observations in other large IPO markets as well as large observed fluctuations in the IPO underpricing figure for different new issues in Nasdaq OMX Baltic.

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Appendices

Appendix no 1. Regression analysis output (GRETL)

```
Model 3: OLS, using observations 1-12
Dependent variable: Underpricing

              coefficient    std. error    t-ratio   p-value
  ---------------------------------------------------------
  const        0.0470893     0.0219563      2.145    0.0757  *
  Proceeds    -0.00382280    0.000958924   -3.987    0.0072  ***
  Turnover     0.162460      0.0641151      2.534    0.0444  **
  Market       0.730207      0.350340       2.084    0.0822  *
  Mcap         0.000376979   0.000105627    3.569    0.0118  **
  Oprice       0.00346058    0.00101377     3.414    0.0143  **

Mean dependent var    0.066054   S.D. dependent var    0.086100
Sum squared resid     0.014357   S.E. of regression    0.048917
R-squared             0.823936   Adjusted R-squared    0.677216
F(5, 6)               5.615693   P-value(F)            0.028979
Log-likelihood        23.34314   Akaike criterion     -34.68628
Schwarz criterion    -31.77684   Hannan-Quinn         -35.76346

Test for normality of residual -
  Null hypothesis: error is normally distributed
  Test statistic: Chi-square(2) = 0.863244
  with p-value = 0.649455

White's test for heteroskedasticity -
  Null hypothesis: heteroskedasticity not present
  Test statistic: LM = 11.9903
  with p-value = P(Chi-square(10) > 11.9903) = 0.285704

RESET test for specification -
  Null hypothesis: specification is adequate
  Test statistic: F(2, 4) = 4.70014
  with p-value = P(F(2, 4) > 4.70014) = 0.0891029


^Underpricing = 0.0471 - 0.00382*Proceeds + 0.162*Turnover + 0.730*Market + 0.000377*Mcap + 0.00346*Oprice
             (0.0220) (0.000959)         (0.0641)         (0.350)        (0.000106)      (0.00101)

n = 12, R-squared = 0.824
(standard errors in parentheses)
```

Appendix no 2. Collinearity test output (GRETL)

```
Variance Inflation Factors

Minimum possible value = 1.0
Values > 10.0 may indicate a collinearity problem

    Proceeds    9.009
    Turnover    6.217
      Market    1.231
        Mcap    3.790
      Oprice    1.109

VIF(j) = 1/(1 - R(j)^2), where R(j) is the multiple correlation coefficient
between variable j and the other independent variables

Properties of matrix X'X:

 1-norm = 1662998.1
 Determinant = 1.9763727e+012
 Reciprocal condition number = 1.1128696e-008
```