Baltic Stock Exchanges' Mergers: the Effects on the Market Efficiency Dynamics

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Submitted to Central European University Department of Economics

In partial fulfilment of the requirements for the degree of Master of Arts

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Budapest, Hungary 2008

Abstract

This paper is to analyse how the change of ownership structure in the Baltic Stock Exchanges affected market efficiency and whether the stock markets react efficiently to the various news announcements. The standard event-study methodology with daily trading data from 2001 to 2008 is used to examine the efficiency of the Riga, Tallinn, and Vilnius Stock Exchanges by investigating the abnormal returns performances surrounding the corporate news announcements. I find that the change of ownership structure in the Baltic Stock exchanges did not lead to the substantial increase of market efficiency. Investors have many opportunities to exploit market inefficiencies. The findings imply of possible insider trading and the need of stricter markets surveillance.

Acknowledgements

I would like to express my sincere gratitude to several people that have greatly contributed to the production of this paper. First of all, I thank our supervisor Gábor Kőrösi for invaluable support with ideas, suggestions and comments throughout the entire writing process.

I am also indebted to Steven Plaut of the Graduate School of Business Administration at the University of Haifa for the inspiration and suggestions.

I am grateful to my cousin - Darius Jazepčikas for his valuable comments.

I would also like to thank Kateryna Hvozdova, Aliaksei Khmurets, Aleksejs Vlasovs, Živilė Stubrytė, Milda Korytė, and other fellow students for their valuable help, mind-blowing discussions, and entertainment.

My sincerest gratitude goes to my family and Frode Bostadløkken, who have provided me with warm support and who have been nothing but encouraging and understanding throughout this experience.

All the remaining errors are mine.

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List of Abbreviations

- AR Abnormal Returns
- BMP Boehmer, Musumeci and Poulsen
- CAPM Capital Asset Pricing Model
- CAR Cumulative Abnormal Returns
- CWP Capital Weighted Portfolio
- EWP Equally weighted portfolio
- RSE Riga Stock Exchange
- TSE Tallinn Stock Exchange
- VSE Vilnius Stock Exchange
- *** Denotes significant at a 1% significance level
- ** Denotes significant at a 5% significance level
- * Denotes significant at a 10% significance level

1. Introduction

The consolidation of the stock exchange is beneficial for both companies and investors, as it increases the companies' value and investment possibilities for investors. The leaders of the OMX Group argues that in order to increase their accessibility and attractiveness for investors the mission of the Baltic states is to "provide a one-stop-shop for trading and settlement in the Baltic region", which would offer a comprehensive, efficient and secure marketplace for market participants (Guide to the Baltic Market, 2007).

Until the 1990s most stock exchanges were state or member-owned, while nowadays the majority is profit seeking and privately owned companies. According to the statistics of the World Federation of Stock Exchanges, in 2005 seventy three percent of the world stock exchanges were private, which is a big change from thirty six percent in 1998 (Cost and Revenue Survey, 2005). This difference could be explained by the technological development in the 1990s, when physical trading floors were transformed to electronic ones. Those introducing the new trading systems first gained competitive advantages. Others had to acquire new electronic systems, buy or merge with exchange technology and clearing firms (vertical merger), or merge with other stock exchanges that already have set up the new systems (horizontal merger) in order to survive the harsh changing environment.

The first European system of stock exchanges – Euronext, based in Paris – was formed in September 2000. It combines Belgian, French, Dutch, Portuguese, and English stock exchanges. Euronext merged with NYSE Group and formed the first global stock exchange NYSE Euronext in April 2007. Stock market integration is noticeable in the Central and Eastern Europe as well. In 1996 the stock exchanges of Czech Republic, Hungary, Poland, Slovakia, and Slovenia formed a common stock market index that is called CESI (Central European Stock Index). In Northern Europe the Helsinki Stock Exchange initiated integration when they acquired strategic ownership in the Tallinn and Riga Stock Exchanges. Afterwards Helsinki Stock Exchange merged with OM AB (Optionsmäklarna) and the joint company became OMX in September 2003. In March 2004 OMX finalized the deal of the ownership change in Vilnius Stock exchange. In the following years OMX acquired the Copenhagen Stock Exchange, shares in Oslo Bors Holding ASA, and the Iceland Stock Exchange (NASDAQ OMX, 2008).

The stock market consolidation led to many changes and greater co-operation and integration between the stock exchanges. The owner of the NASDAQ OMX – Robert Greifeld – argues that the mergers of the stock exchanges in Northern Europe create value and benefits to the shareholders, issuers and investors, and promotes an integrated Nordic securities market. This should strengthen the competitive position of the OMX group and prepare to meet the market challenges of the future. This consolidation is expected to lead to higher liquidity and increase of the market efficiency (NASDAQ OMX press release, 2007).

Although there is a substantial body of literature dealing with the mergers and alliances of the stock exchanges, up until now negligibly little attempt has been made to examine the impact of the stock exchange merger on market efficiency. Furthermore, no one has taken a more detailed look at the Baltic Stock Exchanges' market efficiency after their mergers to OMX Group. Answering how market efficiency has changed is an important contribution to evaluating possible motives for stock exchange mergers. From this research gap the questions emerge:

• How did OMX Group's expansion to the Baltic States affect the market efficiency of the Vilnius, Riga, and Tallinn Stock Exchanges?

What is the present market efficiency in the Baltic States?

In order to answer these questions, I compare the market efficiency before and after the merger in Vilnius, Riga, and Tallinn Stock Exchanges. I apply event study methodology with daily trading to see if there are significant abnormal returns in closing prices before and

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after the news announcements. This information is useful in order to get a better understanding of how the market participants react to news and to identify to what extent the Baltic market is efficient.

The study is structured as follows. The second chapter reviews literature that analyzes market consolidations and efficiency. The third chapter presents the methodology used in this paper. The fourth chapter provides background knowledge of Riga, Tallinn, and Vilnius Stock Exchanges and gives an overview of the data collected for the analyses. In the fifth chapter I present the empirical findings about the OMX Stock Exchange mergers' impact on the market efficiency in the Baltic States. The last chapter concludes the research.

2. Review of Previous Research

There are quite a few studies performed to analyze the stock exchanges' mergers and even more done to test the market efficiency in the global stock markets. However, there is surprisingly little theoretical research dealing particularly with the stock exchange merger's effect on the market efficiency. In addition, unlike for the western countries, very little research is done for the Baltic States. Few studies that have analyzed market efficiency and provided just a general analysis of the Baltic stock exchanges' market efficiency. Thus in this chapter, I review how the stock exchanges mergers affect the markets and their participants. I continue with the presentation of the market efficiency hypothesis. Finally, I present the market efficiency studies that use event study methodology, which is applied in my further analysis.

2.1. Stock Exchange Consolidation

In this section I present the literature analyzing the consolidation of stock exchanges and what kind of impact it has to the stock market. The empirical literature on mergers of the stock exchanges merely looks at the effect of the increased stock exchange's market size on the market efficiency. Many studies analyse theoretically the stock exchange mergers or estimate the trading cost functions of exchanges. Furthermore, the cross-border stock exchanges consolidation is a rather recent trend.

Until 2000 stock exchange mergers were observed in the United States. In Europe they were concentrated mainly on the state level - small local stock exchanges were merging inside the country in order to create a credible capital market on the national level. However, it is hard to compare the United States (US) and European market systems, as most of economies in Europe were rather bank-oriented and the US economy is market-oriented; while America fosters competition, Europe protects competitors. Although in the last decade the differences have diminished, they still exist. The European Commission is much likelier than the American Department of Justice to fear that a merger of two leading companies or the behavior of a dominant one will force rivals out of business, raising prices and restricting business (The Economist, 2008). On the other hand, during the last two decades the European Union expanded substantially, which increased market integration across the continent. Furthermore, researches show that international stock markets are becoming more interdependent (e.g., Taylor and Tonks, 1989; Corhay et al., 1993; Fraser and Oyefeso, 2005; Chelley-Steeley et al., 1998; Kim et al., 2005). Frankel and Rose (1996) and Chelley-Steeley and Steeley (1999) show that during the last decades the European stock markets have experienced an increase in their trading interdependence with each other.

In more recent studies James McAndrews and Chris Stefanadis (2002) argue that the appearance of one single European Stock exchange is still far from reality. Nevertheless, they argue that the market efficiency might have increased due to minimization of the relatively high trading cost and the expenses for information gathering from different countries. However, Nielsson (2007) showed that the integration of ownership of the Nordic and Baltic

stock exchanges did not increase the trading integration, which suggests that consolidation has not been deep enough to produce increased interdependence and the benefits from it.

Nicole Micheletti (2007) argues that mergers of stock exchanges still have many positive aspects. It increases transparency, fair pricing, and good corporate governance. The consolidation protects listed companies: easier access to the information, lower costs, and regulations. Malkamäki (1999) and Schmiedel (2001) showed there are substantial economies of scale from integrating operations and eliminating duplication of fixed costs after the stock exchanges merge. Domowitz and Steil (2002), Schmiedel et al. (2002) extend this analysis showing that stock exchange merger reduces total trading costs, which result in the reduction of raising total equity capital and higher market efficiency.

Another influential factor is technological change in the global market in the 1990s. Back in the nineties almost every single European stock exchange installed a continuous electronic auction. The Deutsche Borse and the London Stock Exchange together spent more than \$200 million to develop separate systems with similar architectures (Steil 2001). However, Steil reckons that these costs can be avoided by the trading system integration of the European exchanges. This integrity can be observed in the Tallinn, Riga and Vilnius Stock Exchanges, which share the same trading system, harmonized rules and market practices, and forms a common Baltic Market. As a result, all this leads to the reduction of cross-border trading costs in the Baltic region and increased attractiveness for investors (Guide to the Baltic Market, 2007).

The new technologies not only reduce trading costs, but also enhance liquidity, which is another factor that should be considered when stock exchanges merge. Pagano (1989) showed that when buyers and sellers are few, they may not find each other immediately, and significant price fluctuations can arise. Thus the consolidation of stock exchanges could lead to bigger number of market participants and greater market liquidity in Europe. In addition, due to the low stock market liquidity in Europe, the average cost per transaction was three times higher than in North America in 1996 (International Federation of Stock Exchanges 1997). The higher transaction costs have reduced ability of the European exchanges to attract listings from the rest of the world, while the opposite has occurred in the United States (Pagano, Roell, and Zechner 2001). Jean-François Copé (2007) writes that the stock exchange merger can create various challenges, like governance of the new entity, security regulations varies from country to country, it is a political issue as well, and some others. However, the author argues that stock exchange consolidation is inevitable and that this kind of merger is beneficial for the market participants. Because it provides higher liquidity, reduces transaction costs, increases reliability of regulatory structure and protection of European public interests. Hart and Moore (1996) found that market efficiency grows with the co-operation of the governance of exchanges as the environment becomes more competitive, and the interests of members become more diverse. All the above-presented studies analyse the stock exchange consolidation effect on market efficiency theoretically without empirical proof.

They show that the stock exchanges mergers have an effect on liquidity, costs, technological and some other improvements. Yet, there have been surprisingly negligible attempts to analyse how the stock exchange consolidation affect market efficiency, which should have increased as a result of consolidation according to the owners of NASDAQ OMX Group (OMX press release, 2005). In addition, efficient markets have a number of implications for both - the investors and the companies. In efficient markets investors would not waste money making fundamental and technical analysis, rather they would select a suitably diversified-portfolio. Furthermore, in efficient markets there are more constraints and deterrents placed on insider dealers. Efficient markets have a number of implications to companies – improved transparency, decreasing principal-agent problem, and some other.

2.2. What is Market Efficiency?

In order to better understand what market efficiency is, and how it could be tested. This section presents the concept of market efficiency, together with tools for its analysis.

In finance theory market efficiency states that it is impossible to "beat" the market, as in the efficient stock market share prices incorporate and reflect all relevant information. According to the Efficiency Market Hypothesis (EMH), stocks always trade at their fair value on stock exchanges, and thus it is impossible for investors to either purchase undervalued stocks or sell stocks for inflated prices (Fama, 1970). Therefore, the idea behind the EMH is that it should be impossible to over perform the overall market through expert stock selection or market timing, and that the only way an investor can possibly obtain higher returns is by purchasing riskier investments (Fama, 1970). The efficient market hypothesis has historically been divided into the three categories (Roberts, 1967):

• Weak form efficiency - the current price reflects the information containing all past prices, which suggests that technical analyses that use past prices alone would not be useful in "beating" the market.

• Semi-strong form efficiency - the current price reflects the information contained not only in past prices but all public information.

• Strong form efficiency - the current price reflects all the available information, public as well as private, and no investors will be able to consistently find undervalued stocks.

In the older theoretical and empirical studies Working (1934), Kendall (1953), Roberts (1959), Osborne (1959), Cootner (1964), Fama (1970), and many others found evidence of the market inefficiencies. They conclude that stocks do not follow random walk, but the market is very close to semi-strong form market efficiency and that past price changes cannot be used to predict future stock prices. However, Grossman and Stiglitz (1980) showed that costs of

information gathering and assessment, information distortion and necessity of constant adjustment to new information shocks in the economy has huge implications for the stock price estimations. The authors argued that these are the reasons why stock prices never fully adjust to new information flows. Fama (1991) reckons that certain market conditions dividend yields, capital restructuring and some other should be adjusted while forecasting market efficiency models.

An event study analyse the immediate stock price's reactions after the various news announcements. It is the most common methodology to identify market inefficiencies. Beaver (1968), Ball and Brown (1968), Fama, Fisher, Jensen, and Rolls (1969) suggested the event studies as a reliable methodology to investigate the semi-strong market efficiency form. The idea behind this method is to see whether specific investment strategies can earn significant excess returns around specific information events, which can be market-wide events, such as macro-economic announcements, or firm specific, like earnings or dividend payment announcements.

Back in 1968, Beaver argued that the variance of stock returns increases for the days immediately around events such as earnings announcements. Ball and Brown (1968) showed evidence of post-earnings announcement "drift" in the direction indicated by a news surprise, they also found that the stock market reacts quickly to the announcements. One year later Fama, Fisher, Jensen, and Rolls (1969) noted that prices reflect not only direct estimates of prospective performance by the sample companies, but also the information content should be taken into account, to be more precise – the effect of simultaneous dividend increases. The overreaction of the stock market to the news announcements results in a violation of stock market efficiency. After earnings announcement drifts question market efficiency to financial theorists (Brennan 1991; Fama 1998). Haris and Gurel (1986) found that there is reversed reaction to the earning announcements from 3.13% to -2.49% over the next 29 trading days in

the SP500 stock prices. Randleman, Jones and Latan (1982) summarized the previous researches on the post announcement stock moves and concluded that the results were consistent with the notion that security prices fail to immediately incorporate all the information that is transmitted on the announcement day of quarterly earnings.

In more recent studies Miller (1996), who analysed 183 firms from 35 countries (both developed and developing), has found that there are positive significant abnormal returns during announcement period, low positive and insignificant abnormal returns in the preannouncement period, and low insignificant abnormal returns in the post-announcement period. Gajewski and Quere (2001) confirmed that stock prices significantly react to the annual and semi- annual earnings announcements in France. However, there is no significant effect caused by quarterly announcements. Fredrik Borjesson (2007) investigated the postearnings announcement reaction for Swedish stocks from 1997 to 2007 by using a trading strategy beginning on the day after the earnings announcements. He found that stock prices usually react quickly to new information. However, sometimes stock prices seem to move in the direction of the earnings surprise after the earnings is publicly known that is called postearnings announcement effects. Brandt et al (2006) showed that besides the actual earnings news, earnings announcement return is presumed to include unexpected information about various other items such as sales, margins, investments, and other less tangible information communicated around the earnings announcements. The authors also estimated that using the knowledge of how investors react to different earning announcements could generate abnormal returns¹ of about 11% on an annual basis.

There have been very few analyses of the market efficiency done in the Baltic States. Klimasauskiene and Moscinskiene (1998) using technical analysis have found that stock prices tend to follow random walk and present weak-form efficiency of Lithuanian stock

¹ Abnormal returns is the component of the return that is not due to systematic influences (market-wide influences). In other words, the abnormal return is the difference between the actual return and that is expected to result from market movements (normal return) (Investor dictionary, 2008).

exchange. Butkute and Moscinskas (1998), Kvedaras and Basdevant (2002) analysed all the Baltic stock markets and concluded that they comply with weak-form efficiency. Using technical analyses, Mihailov and Linoxski (2001) showed that there are no significant positive returns as a result of technical strategies. In the latest study Milieska (2004) concluded weak form efficiency for the Vilnius Stock Exchange. However, these studies test weak form market efficiency and are outdated. It was just two event studies performed to test semi-strong form of market efficiency in the Baltic States. Jarmalaite-Pritchard (2002) shows that there is a link between accounting earning and stock prices in the Baltic stock exchanges, which shows that investors take into account the company profitability, when valuating the company. Kiete and Uloza (2005) analysed how the stock markets react to earnings announcements in Latvia and Lithuania for the period of 2001 to 2004. They found that Lithuanian market is semi-strong form inefficient this.

To conclude this section even though there are many studies to define the form of market efficiency performed on the world scale, not that many for the Baltic States. The evidence from the empirical studies implies strong and semi – strong form market inefficiency in Lithuania, Latvia, and Estonia. The main reason for this could be that the studies were performed at the early stage of the stock market formation. Furthermore, there is no market efficiency analysis since 2004, after the OMX acquisition of the Baltic stock exchanges and showing how this consolidation affected market.

3. Research Design

As outlined in the previous chapter, prior studies of market consolidation mostly focused on the liquidity and the trading cost effects of the stock exchanges merger and there was no analysis done for Estonia, Latvia, and Lithuania. Furthermore, market efficiency analyses in the Baltic States are very outdated. In this section I describe the methodology and the data, which I use for analysis to investigate mergers of the stock exchanges effect on the market efficiency.

3.1. Methodology

Given that my aim is to analyse and compare market efficiency before and after the Baltic Stock Exchanges joined the OMX group, I do this by testing the price reaction to the news announcement in the Lithuanian, Latvian, and Estonian stock markets. In order to answer my research question how markets reacted to the publication of annual and quarterly reports, announcements of mergers before and after the merger of the Vilnius, Riga, and Tallinn stock exchanges to the OMX Group are studied. In order to do this, I conduct the analysis in the following order:

- Firstly, by using Patell's Standardized Abnormal Returns Test I investigate whether the earning announcements contain any valuable information for the market.
- Secondly, applying the Standardized Cross Sectional Test I analyse how the reaction of the market differs with respect to the type of news.
- Finally, by looking at Cumulative Abnormal Returns I simulate the investment strategies that would exploit the inefficiencies and can earn risk adjusted abnormal returns.

In order to understand the above-mentioned tests I start by introducing the methodology of the event studies.

3.1.1. Event Studies

An event study is a typical method for market response analyses of the well-defined events that affect the analysed objects.

Figure 1. Time line for the Event Study



The event concept is depicted in Figure 1. On the variable event time line, the time when event happens is set on the axis as t_0 ; a time period, lasting x days before and after the event is observed; this period is referred as event window. The normal return is estimated over the period from t_2 to t_1 , which is termed as estimation period (Schredelseker, 2002).

The event window should be selected very attentively, as the whole period when the effect of the event is seen on the stock market should be measured. In literature dealing with event studies, the event window varies from 1to 40 days or even less. Kiete and Uloza (2005) accessing the market efficiency in Vilnius and Riga Stock Exchanges applied 21-day event window, which is a common practice in similar type of researches. In this paper I also use an event window of 21 days.

When selecting the estimation period, the benefits should be weighted against the instability of the model. According to Peterson (1989) the length of the estimation period varies from 100 to 300 days. The length of the estimation period used in my research is 190 (it is a period between day -200 and -10 days before the event), which is a common practice in other event studies.

Continuing with methodology, I calculated the returns using the logarithm return formula:

 $R_t = \ln (P_t / P_{t-1})$

Pt: Closing price on the day t.

 P_{t-1} : Closing price on the previous trading day t-1.

The main advantage of the logarithmic return formula is that the continuously compounded returns are symmetric; while the arithmetic returns are not. The price drop from 11 to 10 corresponds to an arithmetic percentage return of 9.09%, while in order to return to the original price level, the stock must appreciate by 10%. According to the geometric return formula the price drop results in a 9.53% decrease, which is symmetric to the percentage that will bring the index to its original level when a continuous compounding is performed. Therefore, in my analysis, as well as in most finance studies for daily price changes, I use daily continuously compounded returns.

In event study analysis it is important to select a correct model for return estimations in order to calculate exact abnormal returns. There are two basic types of models for measuring normal returns: statistical and economic. Statistical models use the assumptions about the behaviour of the assets. In this model it is usually assumed that asset returns are distributed multivariate independently. Economic models use the assumptions about the economic agent and asset returns. In my analyses I use a Market model, also called a Single Index Model. It links the return of any given security to the return of market portfolio. It is better than the statistical model, as it removes variation that is related to market frictions and reduces the variance of abnormal returns. This may lead to an increased ability to detect the event effect (Dubcovsky and Venegas, 2003). In addition, this model has an advantage in comparison to a constant mean return model (statistical), as under the condition of event clustering, the latter model can be miss-specified (Brown and Waren, 1985). Event clustering is likely to be observable for my analysis, as many companies publish their earning announcements on approximately the same dates, which may lead to positive autocorrelation between the time-series of mean adjusted returns (Brown and Waren, 1985). Thus, the Singel Index Market model for the expected return on asset i at a time t is used and could be specified as:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$
(1)
$$\varepsilon_i \sim N(0, \sigma^2(\varepsilon_i))$$

where R_{it} is the return on security *i* on day *t*, R_{mt} is the return on the market index on day t. ε_{it} is a random error term that has a zero mean $\sigma^2(\varepsilon_i)$ variance. The main assumptions behind this model are that markets are efficient and stock price reflects all relevant information. Event is unanticipated and abnormal returns are result of reaction, and there are no confounding effects. Therefore, there are no other factors that could influence the reaction (Fama et al. 1970, McWilliams & Siegel 1997).

For return on market portfolio I construct equally weighted portfolios (EWP) and I use the market indexes (capital weighted portfolio – CWP) provided by the OMX group. The latter index includes all the companies that were listed in the main and secondary Baltic lists at any point of the time. This portfolio approach accounts for the contemporaneous correlations (Patel, 1976).

The abnormal stock return for security i on day t is defined as:

$$AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt})$$
⁽²⁾

where $\hat{\alpha}_i$ and $\hat{\beta}_i$ are the OLS estimates of the market model parameters. The abnormal return for t-1 is denoted as $AR_{i(t-1)}$.

EMH states that abnormal return at a time t depends on the information released at the time t (Fama, Fisher, Jensen, and Rolls, 1969). All the information released before the time t should be reflected in the stock prices. The stock market does not depend on the information that will be released in the future. Normally, the market model can be estimated cross-sectional for each firm by applying Single Index market model, using ordinary least squared (OLS). So from OLS we get $\hat{\alpha}_i$ and $\hat{\beta}_i$, which are assumed to be constant over all the estimation period. The variance of the abnormal returns $\hat{\sigma}_{AR}^2$, is calculated as follows:

$$\overset{\wedge^2}{\sigma_{AR}} = \frac{\sum_{t=1}^{I_i} {\binom{\wedge^2}{\varepsilon_{it}}}}{T_i-2}$$

where T_i is the length of the estimation period. Since the errors are estimated from observations that were not used in the estimation $\hat{\alpha}_i$ and $\hat{\beta}_i$, they are not residuals in strict OLS sense. C_{it} reflects the increase in variance due to the prediction outside the estimation period and takes into account sampling errors in $\hat{\alpha}_i$ and $\hat{\beta}_i$ (Patell, 1976).

$$C_{it} = 1 + \frac{1}{T} + \frac{\left(R_{mt} - \bar{R}_{m}\right)^{2}}{\sum_{r=1}^{T} \left(R_{mt} - \bar{R}_{m}\right)^{2}}$$

T is the number of days in the estimation period; $\overline{R_m}$ is the average market return in the estimation period and R_{mr} is the market return on day r in the estimation period. Thus, the variances for abnormal returns can be calculated as:

$$\hat{V}_i = \sigma_{\varepsilon_t}^2 C_{it}$$

3.1.2. Patell's Standardized Residual Test

To examine whether the abnormal returns for the test period are statistically different from zero, Patell's standardized residual tests are used. This test is particularly good, as it does not take into account the sign of price changes. Thus there is no need to make an assumption about the market expectations (Patell, 1976). The relationship between the squared abnormal returns on the event day and the variance during the estimation period can be expressed as follows:

$$U_{it} = \frac{AR_{it}^2}{\widehat{V}_{it}} \frac{T_{i-4}}{T_{i-2}}$$

The individual residuals are assumed to be cross-sectionally independent and normally distributed; each standardized residual follows a Student t distribution (Cowan and Sergant, 1996). By applying the Central Limit Theorem this ratio can be approximated to the standardized normal distribution (Patell, 1976).

$$Z_{u_{t}} = \frac{\sum_{i=1}^{N} (U_{it}-1)}{\left[\sum_{i=1}^{N} \left(\frac{2(T_{i}-3)}{T_{i}-6}\right)\right]^{\frac{1}{2}}} \sim N(0,1)$$

The null hypothesis of the test is that abnormal returns during the event window are equal to zero.

3.1.3. Standardized Cross - Sectional Test

Maynes and Rumsey (1993) show that the Patell's test for abnormal returns rejects a true null hypothesis too often leading to upward biased significance of abnormal returns. This is particularly misleading for thinly traded stocks. To avoid this, I test using standardized cross-sectional approach, which assumes the variability of the abnormal returns to be different across securities while the variability within a security is constant over time with a potential change only due to the event (Boehmer, Musumeci and Poulsen (BMP), 1991). The change is assumed identical for each day within the event window.

In order to perform the following test, based on the news type, I divided the sample in two sub samples: "good" and "bad" news. The news is considered to be "good" if the present period earnings are larger than the earning of the respective period in the previous years. Large dividends and merger announcement are also considered as "good" news, while "bad" news is earnings decrease, large dividends decreases, and bankruptcy (Elliot, Morse, and Richardson, 1984).

Large positive (negative) abnormal returns after the events indicate the semi-strong form market inefficiency and that the market needs time to adjust after the news becomes public. The rejection of the null hypothesis that E(AR)=0 on any day after the news announcement day implies delays in the adjustment process, which shows semi-strong form market inefficiency in the event window (Sponholtz, 2004).

Significant abnormal returns on the event day, which show semi-strong form market inefficiency, might imply that the market had unrealistic expectations regarding the earning figures, dividends. No effect on the event day could be caused by the perfect market expectations when the market was already aware of the information brought in the announcement. Bhattacharya et al. (1998) suggest that there might be other reasons why there is no reaction in the market. Firstly, the market can be semi-strong form inefficient or that the effect of the event is delayed due to some regulations or a slow market reaction. Secondly, companies in the market may not post appropriate news announcements. In this case, even if the markets are informational efficient, prices have nothing to react to and inferences about the EMH cannot be made. Significant abnormal returns before the event are more questionable. Large positive returns indicate buying activity, which can be related to the speculation behaviour or it might suggest risk-averse investor trading.

For each event, I consider the null hypothesis of no cross-sectional average (cumulative) abnormal returns around the event date. Boehmer, Musumeci and Poulsen (1991) test use the estimated cross-sectional variance of the standardized abnormal returns. This adaptation captures the event-induced increase in return volatility.

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The BMP test takes the following form:



3.1.4. Testing for Cumulative Abnormal Returns

In order to simulate a trading strategy using semi-strong form market inefficiencies, the returns are accumulated from the event day through the period of 10 days. A semi-strong market should incorporate all information publicly available already on the event day. The test adjusts for possible increase in the variance of the returns in the event window and requires calculation of normalized cumulative prediction error:

$$W_{it} = \sum_{t=1}^{L} \frac{\widehat{\varepsilon}_{it}}{\widehat{\sigma}_{i}\sqrt{LC_{it}}} \sim t(T-2)$$

where L denotes the number of dates in accumulation.

 W_{it} is assumed to be an independent variable with known expected value. The null hypothesis of the test is that abnormal returns during the event window are equal to zero. According to the Central Limit Theorem, a normalized sum can be formed (Patell, 1976):

$$Z_{WL} = \frac{\sum_{i=1}^{N} W_{ii}}{\left| \sum_{i=1}^{N} \frac{T_{i}-2}{T_{i}-4} \right|}$$

The null hypothesis is that Z=0, meaning that cumulative abnormal returns after the event are expected to be zero. The semi-strong form of market efficiency would be verified if there are no significant cumulative returns from the event day till any other day in the event window.

3.2. Reliability and Validity

Concerning the selected methodology, there are two main research errors that can affect trustworthiness of the results - validity and reliability. The main concern of reliability is related to the random errors. If there are no random errors one could conduct the same study and get the same results. Hussey & Hussey (1997) showed that not precise data could cause problems. The other concern that might appear is systematic error – meaning that instruments used for the analyses are incorrect (Hussey & Hussey, 1997). Given that my data is collected from the respected, well known, and high quality sources – OMX and Reuter's databases, it is very likely that the secondary data used in my thesis are both reliable and valid.

Event studies are widely used for the analyses of the event impact on the stock's returns. However, the announcement could be correlated to other external events. As a result the study might not capture the impacts on the abnormal returns of the event it is aiming to. Furthermore, in the event studies particularly it is very important to determine the size of the event window. According to Kothari and Warner (2005) the shorter time span is preferred for the analysis. This leads to less ambiguous results, because less noise will affect the future returns, and thus lead to higher significance. Using the maximum possible amount of events and also the 21 days event window solves these potential problems.

In my analyses I introduced two different indices to verify that the results are robust and not dependant on the particular market index. Thus I created an equally weighted index consisting of all analyzed stocks and used the market indices provided by the OMX. As seen from the analyses below, both indices generate the same results, this rules out the risk of bias to the large capitalization companies, which have different weight in calculating OMX indices.

3.3. The Baltic Stock Exchanges and Regulations

In this part I review the institutional development of the Baltic Stock Exchanges and the regulations related to the market efficiency. The consolidation of the Baltic Stock Exchanges started in April 2001, when HEX Group acquired a strategic ownership in the Tallinn Stock Exchange, followed by the majority ownership acquisition of the Riga Stock Exchange in August 2002. A very important merger for the region was between Finnish and Swedish securities market operators into OMX in the end of 2003. As a result, the merged company became the market leader among the Northern Europe's stock exchanges. The privatisation and merger of the Vilnius Stock Exchange with OMX took place on the 28 May 2004 (for more details on ownership structure of the Baltic stock exchanges see Table 5 in Appendix 1). After this merger the new trading platform – SAXESS, harmonized market practices and rules, and the common trading information display with Tallinn and Riga Stock Exchange was introduced in Vilnius Stock Exchange as well. In addition, since September 2004 all three Baltic exchanges view themselves as one market. The main attributes of the joint market (Baltic Guide 2003-2004, 2004)²:

- Common Baltic list of securities
- Common index for the Baltic markets

 Common trading system SAXESS in Estonia and Latvia starting from September 2004. The new Nordic-Baltic trading platform is used by six exchanges: Sweden, Denmark, Iceland, Finland, Estonia and Latvia.

Common trading information display for Estonia and Latvia

Harmonized market practices and rules for Estonia and Latvia

Furthermore, the single market, the new common trading platform, and larger integration are very important in increasing market efficiency (OMX Market View, 2005).

² For more information see Appendix 1.

They believe that "the core idea of which is to minimize to the extent possible the differences between the three Baltic markets in order to facilitate cross-border trading and attract more investments to the region. This includes sharing the same trading system and harmonizing rules and market practices, all with the aim of reducing the costs of cross-border trading in the Baltic region." (NASDAQ OMX, 2008)

Furthermore, the statistics shows that during the last eight years the Baltic Markets attracted a lot of interest from non-resident investors, which make up 40% of all investors in all the analysed exchanges (for more details, see Table 7 in Appendix 1). In addition, the stock exchanges consolidation took place at the same time as the Baltic countries entered the European Union, which had a psychological effect to foreign investors, as their confidence increased in the Baltic markets.

All the statistics point to the positive development of the Baltic stock exchanges, as the number of listed and actively daily traded companies, market capitalization, all three indexes, and market liquidity levels have been all rapidly increasing over time (see table 6 in Appendix 1.) Furthermore, the first three initial public offerings were arranged in Tallinn in 2005. Several companies were delisted due to low liquidity, bankruptcy and other issues during the period 2000-2008 and they are not included in my analysed statistical sample. As it is see from the Table 1, in total there were 37 number of companies delisted from the Baltic stock exchanges during 2000-2008. The majority of them come from Latvia – 19, followed by 11 companies from Lithuania, and 7 from Estonia.

Tuble 1. Humber of companies in the Buttle States during the period 2001 2000									
Year	Number of	Number of IPOs	Number of delisted						
	companies		companies						
2001	126	-	6						
2002	128	-	7						
2003	114	-	5						
2004	95	1	4						
2005	104	3	0						
2006	98	3	10						
2007	99	3	5						
2008 04	99	-	3						

Table 1. Number of companies in the Baltic States during the period 2001-2008

Source: NASDAQ OMX Group, 2008

All the companies listed in any of three stock exchanges are a part of the Baltic Equity list, which consist of the Main and Secondary Lists. In March 2008 there were stocks of forty-one company on the Main list – six are listed in the Riga's stock exchange, seventeen are listen in the Vilnius Stock Exchange, and the rest eighteen listed in the Tallinn Stock Exchange. There are fifty-eight companies in the Secondary list – thirty-three are listed in the Riga's Stock Exchange and the remaining twenty-five are listed on the Vilnius Stock Exchange. The companies listed on the Main list makes 64, 64 % (out of this Riga Stock Exchange – 24, 54%) of total equities market value in the Baltic Stock Exchange.





Source: NASDAQ OMX Group, 2008

As can be seen from the Graph 1, the indexes were relatively stable before the new trading system (red sticks) by the new owners – OMX group was introduced, which resulted in more security trading, and larger fluctuations of the indices' values.

When analysing the dynamics (see graph 2) the upward trend of market capitalisation is clear, which seems even stronger in the years after the merger. It can be observed that turnover has reached to 2109 MEUR in Latvia, 6807 MEUR in Lithuania, and 4110 MEUR in

Estonia on the 1st of January 2008. This could be a result of the OMX acquisition of the Baltic stock exchanges.



Graph 2. Total market capitalisation (TMC) in the Baltic States for the period 2001-2008

All three stock exchanges possess similar regulations issued by the governments of the Baltic States. Each Baltic country has a national financial supervisory authority that control market in the country. The control of the supervisory is very important in order to ensure the stability and reliability of the market. Individual investors can file their allegations with supervisory authority in heir country. During the last few years several amendments have been made in national legislation in order to increase the protection of the minority shareholders rights in all three countries (Baltic Guide 2007, 2007). The companies listed on the Baltic Stock Exchanges have to publish annual and semi- annual earning reports. The ones that are listed on the Main List have to publish quarterly earning reports as well (Lithuanian Security Commission, 2002, Latvian Securities and Exchange Commission, 2003, Financial Supervision Authority of Estonia, 2002). All the above presented factors make it interesting to investigate the chosen period of time to see what conclusion can be drawn form the study of the Baltic stock market efficiency.

Source: NASDAQ OMX Group, 2008

3.4. Data

3.4.1. Data collection

The investor trading surrounding the event is analysed in this paper. I have chosen the period 2001 – 2007 to test the market efficiency of the Baltic stock market. Reilly and Brown (2003) claim that in Europe the consolidation of the existing exchanges can be explained by economies of scale required by these security market operators, including the need for significant expenditure for technology to remain globally competitive. OMX provides one of the leading technologies in the world and straight after the consolidation they introduced new trading systems in the Baltic States. Thus, I have divided the period into two sub-samples before and after the 1 June, 2005 for Vilnius Stock Exchange, and the 1 September 2004 for Tallinn and Riga Stock Exchanges. These are the days when the OMX group took a lead of the Baltic Stock exchanges and introduced new trading platform – SAXESS – in the Baltic States. The second period continues till the 1 January 2008, as since 2008 Baltic stock markets face crisis and not normal trading is observed. The event data is constructed of 297 events ("good" and "bad") for Lithuania, 83 for Latvia, and 114 for Estonia for the first subsample, and 318 events for Lithuania, 154 for Latvia, and 125 for Estonia for the second subsample. The events recorded for 31 companies in Lithuania, 11 in Latvia, and 9 in Estonia (for more details see table 8 in Appendix 1).

To collect the event information, I used the NASDAQ OMX Group web page as a reliable source for event information, as according to the financial security laws, listed companies are obliged to provide the important news "before or immediately after, but not later than the news is announced to mass media" (Lithuanian Security Commission, 2002, Latvian Securities and Exchange Commission, 2003, Financial Supervision Authority of Estonia, 2002). Thus stock exchanges in all the Baltic countries should be a primary source of information.

For event studies the exact day and time is very important. The news is posted through out the day, but trading is possible only from 10:00 to 14:00 in all three Baltic stock markets. This suggests that not all the news that is posted on a particular day belongs to that particular trading day, as investors cannot use the information received after the trading time is over. In this respect, I assumed that news that appears before 14:00 could be still reflected in that date trading, but if news was posted after 14:00, I allocated to the next trading day. NASDAQ OMX group's database has the advantage of providing the time of announcements to the nearest minute.

3.5. Trading data

In the research I use daily trading data collected from the NASDAQ OMX Group and Reuters terminals. I have chosen the period from January 2001 through December 2007 for the companies currently listed on the Baltic Main List and Baltic Secondary List, which is composed of Vilnius, Riga, and Tallinn Stock Exchanges' Main and Secondary lists.

3.5.1. Adjustments for dividends and changes in Capital Structure

To make event studies more significant and reliable, I have adjusted my data to the dividends by adding the value of dividend to the stock price on the ex-dividend day in the way it is done by the Baltic stock exchanges for market indexes' calculation (NASDAQ OMX group, 2008). Concerning capital structure, NASDAQ OMX Baltic stock exchanges do not provide enough information of their adjustments. Nevertheless, the stock price is restricted to fluctuate by more than 15% during the day, unless there are changes in capital structure (NASDAQ OMX group, 2008). Thus I omitted returns higher than 15% from the database as being affected by capital structure changes.

3.5.2. Adjustments for thin trading

Baltic stock exchanges are small markets and trading is not as thick as in the Western Europe or US stock exchanges. Although the stock exchanges were established shortly after the countries gained independence from Soviet Union, there was very little volume trading till 2004. There is no single standard method to calculate daily stock returns on days when stock is not traded. Maynes and Rumsey (1993) studied thin, moderate, and thickly traded of Canadian securities and provided a good framework for conducting event studies on a small stock exchange. They present three methods to deal with thin trading, firstly - lumped return method, when the entire return is allocated to the day the respective stock was traded, while on the non-trading day the return is set to zero. The second method is called a uniform method, which calculates total returns between trades and then allocates average daily returns to each day over the multi-period between trades. Both methods might result in underestimation of the returns' variance due to many nulls in the return series and bias the test statistics that judge the significance of the abnormal performance. The third method Maynes and Rumsey (1993) have proposed is called trade-to-trade method and it is based on usage of the multi-period returns with allocating them over the time interval. The researches found that the lumped returns method performs about the same as uniform return and trade-to-trade return methods (Maynes and Rumsey (1993), Sponholtz (2004)). Based on these studies, I used the lumped procedure, which is easier to compute.

In addition, in the event studies of the stock exchanges with infrequent trading it is a common practice to place certain criteria on the stock trading in order to proceed with the study. The minimal requirements for the events to be included in the study are that the stocks are traded in at least 1/3 of the estimation period or at least 1/2 inside the event window (Sponholtz, 2004).

4. Empirical results

This chapter presents the results of the Baltic Stock exchanges' analysis by countries and the comparison of the market efficiencies after and before the stock exchanges mergers in order to check the effect of the change of ownership in the stock exchanges.

4.1. Market efficiency form in Lithuania

4.1.1. Information content of earnings announcements

In order to test the significance of the information content of the news announcement in the Vilnius Stock Exchange, Patell's standardized residual tests will be applied for this matter. In table 2 the results of Z_{Ut} statistics for the event window are presented. Since I do not know the variance of the population, just the variance of the analyzed sample, I use student's *t*-distribution for the significance checking.

	2001-2005		2005-2007	
Event day	EWP	CWP	EWP	CWP
-10	0,81	1,93*	-0,71	-0,13
-9	-0,69	1,64	5,46***	2,32**
-8	2,55**	-0,52	4,28***	0,17
-7	7,36***	1,06	-1,78*	-2,24**
-6	-1,46	1,83*	-0,63	-1,99**
-5	0,53	2,01**	2,51***	2,15***
-4	1,09	2,84***	-1,66	-1,94*
-3	3,34***	3,50***	2,35***	-0,51
-2	5,58***	-1,20	-4,01***	-4,01***
-1	6,06***	0,48	2,37**	0,97
0	25,92***	27,73***	24,19***	22,84***
1	10,13***	5,88***	9,91***	9,66***
2	6,93***	-0,21	4,08***	4,34***
3	2,93***	2,86***	-1,05	1,56
4	6,06***	-0,47	2,65***	0,36
5	0,75	0,77	-0,02	0,83
6	2,69***	4,37***	1,12	0,40
7	1,68	3,34***	2,84***	1,72*
8	5,63***	2,23***	2,38***	1,56
9	0,27	1,79*	4,27***	3,78***
10	-1.02	-1.16	-0.38	0.13

Table 2. Test of information content for the period 2001-2007 in Lithuania

Notes: The table presents the test statistic Z_{Ut} for Lithuania in two periods before merger and after. In the first period it contains 297 events and in the second period it contains 318 events. See the list of abbreviations for legends.

From the table 2 it can be clearly seen that news announcements do contain valuable information. The abnormal returns are significant on the announcement day in both periods, with Z_{Ut} of more than 22 for both market portfolios – the Equally Weighted Portfolio (EWP) and the Capital Weighted Portfolio (CWP). Furthermore, the results show that there are significant price drifts before and after the event.

Before the merger the market significantly fluctuated three days before the announcement day, which is proved by Z_{Ut} of more than three for both market portfolios. This market noise could signal insider trading or market speculations, as knowing the date of news announcement investors could try to "beat" the market and profit from the outcomes. However, the speculation period increased even more after the stock exchanges merged, as the significant Z_{Ut} s are observed five days before the news announcement and continue till the event. The size of the significant Z_{Ut} increased even more in the second day before the announcements, which once again imply possible information leakages. In order to make market more transparent and reduce possible information leakages, "Investor calendar" was introduced in the Vilnius Stock Exchange (VSE), which informs investors about the future meetings of the company, posted results of activities, corporate actions and dividend. Most of the companies still do not provide exact dates all the time and investors do not know exactly the days of announcements, as a consequence an insider trading is more likely on the days before the event. In addition, there were several cases, when the insider trading was noticed. For example, Lithuania's Securities Commission has imposed a EUR 11000 fine on Finasta brokerage for insider trading, claiming that the brokerage used private information while trading Alita stocks in the VSE (Verslo Zinios, 2007).

During the period 2001 - 2005 the significant trading continues for approximately four days for both EWP and CWP, which indicates a slow adjustment process for the overreaction on the first day and market inefficiency. Risk adverse investors, who are more confident in

trading after their knowledge of the company has increased, can cause this return drift. On the other hand, after the news was released the investors remembered about the company and they started trading the company's stocks. The market efficiency slightly improved after the stock exchange merger and the adjustment process shortened to two days after the announcement days. The improvements could be due the new electronic system – SAXESS – that was set up after the merger. SAXESS made the trading easier, which resulted in the increased liquidity and transparency of the market. Secondly, the investors became more familiar with the listed companies, which results in more accurate expectations. Thirdly, the new stock exchange owner introduced investor education programs, which increase the understanding of trading and investing. Fourthly, the media work has improved in recent years, as it became more efficient or more organized. The news is posted much faster than it was ten years ago (NASDAQ OMX, 2008). Finally, Lithuania joined the European Union in 2004, which had a psychological effect – the confidence in the market grew, and that resulted in soaring investments in many sectors, especially foreign investors were more attracted to the Baltic market.

4.1.2. Market reaction to the "good" and "bad" announcements

As seen in the graph 3, there are significant abnormal returns of almost 1% on the "good" news announcement day for the period before the merger (for significance of the abnormal returns, see table 9 in the Appendix 2). However, the abnormal returns have significantly decreased after the stock exchange consolidation that signifies market efficiency improvements and implies that it is harder to earn high profits on VSE. On the other hand, due to increased transparency and liquidity of the stock market, the variation in abnormal return related to "good" news became less extreme in general after the introduction of the new trading system.




Before the consolidation of the stock exchanges happened negative significant returns are observed on the fourth day before the news announcement. In addition, Meulbroek (1992) and Wong (2002) found that it is normal to see some abnormal returns before the earnings announcement day even in North America, Hong Kong, and China's stock markets. The researchers argue that it is due to insider trading. However, as the returns are negative the more appealing explanation is that it could be caused by speculations. It could also be a result of the risk-averse traders, who try to anticipate the news and start more active trading before the news is published. For the period 2005 - 2007 positive abnormal returns are observed before the event as well, which imply information leakages and insider trading. These results could denote that the insider trading, speculations, or risk-averse investor trading even increased in the later period.

Considering the results after the "good" news announcement day, already the first day after the event the abnormal returns decreased. However, the results are not significant. The correction for the profit taking continues for the next two days in the period 2001 - 2005 and for the even longer time span in 2005 - 2007, which implies slow reaction to the news.

³ For the significance of the test see Appendix 2.

Graph 4. Average abnormal returns for "bad" news for EWP in Lithuania⁴



- 2001-2005 - 2005-2007

As it can be observed from the graph 4, the abnormal returns follow random walk for both periods before the "bad" news announcement. Furthermore, before the stock exchange merger the abnormal returns' line reminds random walk and the significance of the abnormal returns was much lower, which indicates relatively high weak form market efficiency. However, the results differ for the period after the stock exchange merger. As it can be seen in the graph 4, significant negative drift is observed on the day of the "bad" news announcement after the stock exchanges merged. Furthermore, the significant negative results continue for two more days after the news was announced, which indicates that investors react longer and possibly market inefficiency increased after the stock exchanges have consolidated.

From the table 10 (see in Appendix 2) it can be seen that there are fewer significant Z_{BMPt} for "good" news in both periods after the announcement day. The higher number of the significant Z_{BMPt} s for the "bad" news could be explained by the assumption that "bad" news spread at a slower rate than the "good" ones. Furthermore, the whole economy grew during the analysed period; most of the companies listed on the stock exchanges possessed growing revenues and profits. Thus, for the investors it was harder to absorb negative news and it took

⁴ For the significance of the test see Appendix 2.

longer time to react. Furthermore, investors react earlier before the "good" news announcements rather than before "bad" ones. While, the early trade before positive news could be caused by the insider trading, as in the earlier phase they recognise the promising signs and the growth of the company. They see that the company is doing well and insiders want to get an additional bonus for their job. As a consequence, they start trading on the market, which leads to the additional upgrade of the stock prices. This hypothetical explanation should work for the sell transactions in a downward market ("bad" news) as well, since insiders have the same access to the informational in this case. However, the results for the "good" and "bad" news do not show the same, meaning that it can be easier for insiders to trade on "good" news rather than "bad" as they can be easier caught on "bad" news trading and information leakages, thus they hesitate longer before they decide to trade before the "bad" news announcement.

In general, there are less significant $Z_{BMPt}s$ for the period before the merger, which indicates possible market efficiency decrease after the VSE became a part of OMX Group.

4.1.3. Cross sectional analysis

Graph 5 plots the cumulative abnormal returns for two portfolios – "good" and "bad" news for the period before the stock market merger. The results are consistent with the both tests above. The outcomes are pretty intuitive and the upward changes are observed for the first five dates after the "good" news announcement. Thus, in the first analysed period the correction of the overreaction starts just on the sixth day, when the decline of CAR is observed; the downward drift continues until the tenth day, when the CAR become almost equal to zero. In comparison to the period after the merger the correction for overreaction on the event day starts already the day after and the decline continues till the seventh day (graph 6).

The positive cumulative abnormal returns are observed on the "bad" news announcement day, but the next day fall can be seen in 2001 - 2005, which implies slow investors reaction to "bad" news.



Graph 5. Cumulative abnormal returns for the EWP in Lithuania (2001-2005)⁵

Graph 6. Cumulative abnormal returns for EWP in Lithuania (2005-2007)⁶



Contrary to the period before the merger, the negative returns are already observed on the event day for years 2005-2007 (see graph 6). Furthermore, the inefficiency seem to exist for much longer period – all five days after the announcement, when the CAR line turns

⁵ For the significance of the test see Appendix 2.

⁶ For the significance of the test see Appendix 2.

upwards and continues till the end of the analysed period. This could be also related to the Lithuania's economic growth in general and that companies in the period 2005-2007 were mostly profitable and expanding (for more details see table 6 in Appendix 1). "Bad" news was much less anticipated and created longer period of the cumulative abnormal return's decline.

After the simulations of possible trading strategies it can be seen that the Lithuanian market is semi-strong form market inefficient, as the same direction price drifts continues for the several days after the event. However, the investors were better anticipating "good" news after the merger and the event-created surprise was corrected already the day after the event. The same could not be said about the "bad" news. Thus investors could earn profits by short selling stocks on the day of "bad" news announcement and selling them till the fifth day, after the correction for the overreaction starts.

4.2. Market efficiency form in Latvia

4.2.1. Information content of earnings announcements

Table 3 shows that in Riga's stock exchange (RSE) investors react to the news in a similar fashion as in VSE. During the whole period of 2001 - 2007 there are significant investors' reactions on the announcement days, which signifies that the information content of news do possess value for the market. However, the Z_{Ut} values were substantially larger for the period after the stock exchange merger, which could indicate that information brings larger value in the later period.

The possible signs of the information leakages, selling of risk-averse investors, or speculations are observed starting from the seventh day before the news is posted during the period of 2001-2004, while the significant Z_{Ut} appears on the fifth day before the announcement for the period after merger (2004 – 2007). In addition, after OMX merged with RSE the significant Z_{Ut} are observed on the second and first days before the news announcement that could signify that insider trading became easier after the stock exchanges

have merged or that the days of announcement became more planned so that investors can know exactly when the news will be posted. As a result, they are willing to speculate several days before the event.

	2001	-2004	2004	-2007
Event day	EWP	CWP	EWP	CWP
-10	0,42	-0,75	1,47	7,19***
-9	0,99	0,49	1,51	5,07***
-8	1,89*	1,70*	-2,92***	0,74
-7	-2,55**	-2,72***	0,76	0,81
-6	-2,48**	-2,29**	-0,33	-0,33
-5	-0,71	-0,54	-3,17***	-2,20**
-4	-0,06	-1,71*	-2,02*	0,02
-3	1,14	0,89	0,55	0,49
-2	-1,71*	-1,44	2,13**	2,54**
-1	0,86	-0,97	5,09***	5,31***
0	3,53***	4,08***	21,78***	23,13***
1	1,23	1,19	10,98***	10,04***
2	-2,31**	-1,39	4,34***	2,85***
3	7,54***	6,68***	1,54	1,83*
4	-0,07	-0,34	0,46	0,08
5	0,75	1,44	2,55**	7,35***
6	6,79***	5,47***	0,02	1,52
7	5,73***	2,17**	-1,33	2,37
8	2,33**	2,39**	-1,72*	-3,09***
9	1,88*	2,20**	-0,72	1,09
10	-0,81	-0,91	0,30	2,44**

Table 3. Test of information content for the period 2001-2007 in Latvia

Notes: The table presents the test statistic Z_{Ut} for Latvia in two periods before merger and after. In the first period it contains 83 events and in the second period it contains 154 events. See the list of abbreviations for legends.

From the table 3 it can be seen that the different trends follow the post announcement day in the two analysed periods. Before the stock exchange consolidation, the market exhibited significant price movements for around nine days after the news was posted. Just for the first two days after the event significant movements of the stock price are detected after the stock exchange consolidation. Then in a week's time (sixth day) investors react significantly to the information once again. Thus, shorter period of price drift is observed, which could imply market efficiency increase after the merger. However, the results are noisy and it is hard to make definite conclusions about the market efficiency development due to the stock exchange merger.

4.2.2. Market reaction to the "good" and "bad" announcements

Like in Lithuania, "good" and "bad" news possesses huge information value on the announcement day in Latvia as well. The significant positive drift of abnormal returns is observed on the "good" news announcement day during the both periods (graph 7). The higher abnormal returns are seen for the period before the merger, which could imply that it is harder to "beat" the market after the stock exchange merged. Furthermore, the difference is not that big and it could be also influenced by the smaller sample in the first period.

Graph 7. Average abnormal returns for "good" news for EWP in Latvia⁷



The results are consistent with those from the Patell's standardized residual test. The significant Z_{BMPt} statistics and positive abnormal returns are observed already on the fifth day before the event day, which implies information leakages or speculations. The same trend is detected for the period after the merger, which is also similar to the market reaction in the VSE. In contrast to the results before the merger, where the abnormal returns are significantly negative, they are significantly positive on the fifth day before the event in the second period. This could be explained that after the merger it is easier to foresee the days of news announcement in the RSE. Thus, investors try to anticipate the news and speculate on the market.

⁷ For the significance of the test see Appendix 3.

After the event day, the decline of abnormal returns can be seen for three days during the both periods, meaning that market stabilizes and balances the overreaction. The slow stabilization process implies market inefficiency. The pattern of the overreaction and reversal effect proposes that the "reminding" effect could be also possible. As the Z_{tBMP} statistics are significant on the event day for both periods, from the test results for the "good" news it is not possible to conclude that the OMX and Riga's stock exchanges merger led to the increase of the market efficiency.





As it can be seen in the graph 8 investors react to "bad" news in a similar way as to "good" ones. Significant negative abnormal returns are observed for both periods on the event day. The negative abnormal returns are observed on the third day before the event as well, which confirms the hypothesis, generated in the previous paragraph, of insider trading before the merger in the Latvian stock market. However, the same drift cannot be observed in the period after the stock exchange consolidation, implying that it might be harder for insiders to trade on the negative information after the stock exchange merger. This could be a result of stricter regulations by the new owners, more transparent and efficient trading system, and by the enforced supervision of the Financial and Capital Market Commission of Latvia.

⁸ For the significance of the test see Appendix 3.

The negative significant abnormal returns follow two more days after the "bad" news announcement. This is a very slow process of fixing the overreaction to the "bad" news, which indicates market inefficiency. If both periods are compared, no improvements concerning market efficiency can be observed. However, taking into account that sample size of the "bad" news is limited, these significant abnormal returns might as well be spurious.

The "good" and "bad" news inspires investors to buy the particular security on the event day; this could signal that the announcement reminds them about the certain company, or the news is better than the market anticipates. The significant Z_{BMPt} statistics before the announcement day suggest of possible insider trading, speculations, or that risk-averse investor selling or buying depending on the context of news anticipated. The overreaction followed by "good" and "bad" news announcement might imply that semi-strong form of market efficiency might not hold in Latvia during either period.

4.2.3. Cross sectional analysis

As seen in graph 9 positive significant returns are observed on the event day the correction of the overreaction starts the next day after the event. Investors might still get positive abnormal returns on the next day after the "good" news announcement for the period before the merge. The decline of CAR' curve continues from the second to sixth day after the "good" news was publish, which implies slow market fixing of the overreaction.

From the graphs 9 and 10 the results show that investors react much faster to the "bad" news in the period 2004 - 2007. In 2001 - 2004 the CAR curve continues to decline during all 10 days after the news announcement. After the merger the signs of fixing overreaction are observed already on the second day after the event, when the positive returns are received, which implies some stock market's efficiency improvements.

Graph 9. Cumulative abnormal returns for EWP in Latvia (2001-2004)⁹



Graph 10. Cumulative abnormal returns for EWP in Latvia (2004-2007)¹⁰



The tests' results show that investors react to "good" news rather faster than "bad" ones in Latvia during both periods. This might imply that "bad" news contains more unexpected component, according to which the market participants take time to revalue the stock price. From these simulations, it can be seen that even though the opportunities for earning high profits decreased, there are still many possibilities of exploiting market inefficiencies. Concerning "good" news, investors could buy stocks on the event announcement day and sell it day after, which would bring profits. In order to earn money on

⁹ For the significance of the test see Appendix 3.

¹⁰ For the significance of the test see Appendix 3.

the negative news, investors should short sell on the event day and buy back on the fifth day of event window to gain the maximum profits.

4.3. Market efficiency form in Estonia

4.3.1. Information content of earnings announcements

The Z_{Ut} statistics for Estonia shows that country follows similar trends to its neighbors – Latvia and Lithuania. As table 4 shows, the Z_{Ut} is very high on the event day for equally and capital weighted portfolios during the both analyzed periods – after and before the Tallinn Stock Exchange (TSE) became a part of the OMX group. However, there are some differences in the scope and significance of Z_{Ut} before and after the announcement day when comparing the statistics for both periods.

Analyzing the period prior the news announcement, it can be seen that information contents starts to become significant already on the six, four, two days before the event day in 2001 - 2004. After the merger the information content is significant already on the eight day before the news announcement and continues to be almost all days till the event. This implies possible information leakages, risk-averse investors trading, or speculations in the market. Like in Riga and Vilnius, the significant Z_{Ut} is observed for the first, sixth, and eight days after the announcement day in the both analyzed periods in Tallinn as well. This could imply that market participants react rather slowly to the news. For the period after the stock exchange merger significant Z_{Ut} are detected even on the last event window day – tenth. This could also be explained by the "reminder" effect that the market remembers about the company's existence. The significant values in the late day (eight, ten) of the event window could be induced by current market news or some not news related factors.

Event day	2001-2004		2004-2	2007
	EWP	CWP	EWP	CWP
-10	0,50	-2,36**	-2,58**	-2,59**
-9	-0,24	-0,78	0,25	-1,00
-8	-0,21	-1,71	2,20**	2,01**
-7	-1,29	-2,02**	0,35	0,54
-6	-2,07**	-3,75***	10,59***	2,95***
-5	-0,32	-2,43**	3,21***	3,66***
-4	-0,43	-1,31	4,86***	-1,24
-3	-0,49	-0,95	1,12	0,05
-2	-2,24**	-3,96***	3,11***	2,99***
-1	2,99***	1,81*	0,13	-1,17
0	9,42***	6,75***	7,45***	8,49***
1	5,68***	5,88***	6,21***	4,76***
2	-0,40	-3,09***	-1,23	-1,32
3	-0,84	-2,46**	10,37***	0,72
4	2,18**	0,03	2,11**	0,69
5	0,14	-0,75	7,71***	1,26
6	-0,58	-4,87***	12,37***	4,63***
7	-1,60	-2,92***	0,45	-0,23
8	-2,18**	-3,23***	4,43***	4,25***
9	-0,96	-2,92	-0,50	-0,96
10	1,05	0,15	-2,18**	-1,94**

Table 4. Test of information content for the period 2001-2007 in Estonia

Notes: The table presents the test statistic Z_{Ut} for Estonia in two periods before merger and after. In the first period it contains 114 events and in the second period it contains 125 events. See the list of abbreviations for legends.

The findings of the Patell's Standardized Abnormal Return test show that the news possesses information content, since the event days have very high Z_{Ut} in all the sub-samples for Estonian stock market. Furthermore, the long path of adjustment to the announcement indicates semi-strong form stock market inefficiency.

4.3.2. Market reaction to the "good" and "bad" announcements

The Boehmer, Musumeci and Poulsen test shows that the Tallinn Stock Exchange follows random walk before and after the announcement days in the both analyzed periods. As it can be seen in graph 11, "good" news demonstrates large significant abnormal earnings on the event day for both analyzed periods. In comparing two periods it can be observed the same trends as in the other Baltic countries: the size of the abnormal returns has decreased after the stock exchange merger, which could imply that the information was more expected and possess lower value to the market.

Significant positive returns could be spotted on the fifth and fourth days before the announcement for the period 2001-2004, which is also consistent with the findings from the Patell's standardized abnormal return test. The positive significant returns observed on the fifth and third day before the event day for the second period. These results imply about possible information leakages in the Estonian stock market. In addition, OMX agrees that the main two problems related to the disclosure of the stock exchange information or companies' mistakes concerning it on the basis of the ten-year experience of the Estonian security market are (NASDAQ OMX, 2008):

Leakages of information (and the consequential need to give comments)

 Delay in informing the market about the decisions, which affect the stock price.

In the optimal situation, a company should inform investors in advance about the date of disclosing any regular information. In addition, to fix the above-distinguished problem Tallinn Stock Exchange introduced "Investor calendar", which should increase information transparency in the stock market.

Negative abnormal returns are seen on the first day after the "good" news was posted, which could mean that investors overreacted on the event day and the outcomes are fixed by the negative abnormal returns. The positive significant returns are detected again in a week's time after the news was announced, which might signify slow reaction of the investors as well. Otherwise, this could indicate the "reminder" effect; meaning that investors remember the company and become more active in trading the respective security after the news was published.

Graph 11. Average abnormal returns for "good" news for EWP in Estonia¹¹



Graph 12. Average abnormal returns for "bad" news for EWP in Estonia¹²



Concerning the investor reaction to "bad" news, large negative abnormal returns are noticed on the event day as well. As the results in graph 12 reveal, the negative returns are even larger after the stock exchanges have merged, which indicates that trading on "bad" news is easier to win against the market.

 ¹¹ For the significance of the test see Appendix 4.
¹² For the significance of the test see Appendix 4.

Like for "good" news, after the stock exchange consolidation significant positive abnormal returns are observed five days before the announcement. This could lead to the hypothesis of speculation, as investors attempt to predict the news and they try to "beat" the market based on their anticipations. The same trend cannot be observed for the sample before the stock exchange merger. Furthermore, there is no significant trading before the announcement. This could indicate that insider trading on "bad" news decreased or it might be also caused by the small sample size of the "bad" news, as companies exhibited huge growth during the respective period and as a result there were not that much "bad" news.

For the period after the merger the negative returns with significant Z_{BMPt} statistics could be observed till the third day after the "bad" news was posted (table 18.in Appendix 4). This indicates the slow reaction of the investors and market inefficiency of the investors.

The BMT test indicates that the Estonian market is semi-strong form market inefficient. The statistics also shows that possible information leakages or speculations might exist in the market. In addition, the investors slowly react to the new information in the market.

4.3.3. Cross sectional analysis

From the graphs 13 and 14 it can be seen that investors overreact to both "good" and "bad" news in both analysed periods. Analysing the market reaction to "good" news, it can be seen that CAR, despite a small decline on the second day after the event, continue to grow till the sixth day, the similar trends are observed in the second period, meaning that investors react very slowly to the positive news. This also implies that investors can buy stocks on the event day and sells them any time over the event window and earn the profits.

Graph 13. Cumulative abnormal returns for EWP in Estonia (2001-2004)¹³



Graph 14. Cumulative abnormal returns for EWP in Estonia (2004-2007)¹⁴



Comparing graph 13 and 14 it can be seen that investors were slower to react to the "bad" news in the period before the merger. The declining curve is observed for the whole 10day time span in the period 2001-2004, while in the period after the merger such clear trend is not seen. Furthermore, the correction for the overreaction already starts on the second day after the news was published. Over time the information became more accessible. Therefore, when making investment decisions it is better understood. This also could imply that market became more efficient and investors react much faster to "bad" news or anticipate them better.

¹³ For the significance of the test see Appendix 4.

¹⁴ For the significance of the test see Appendix 4.

4.4. Comparison of results in Riga, Tallinn, and Vilnius Stock Exchanges

Patell's standardized residual tests reveal that news announcements possess information content before and after the stock exchanges have merged in all three Baltic States. Before the stock exchange consolidation Z_{Ut} are the highest of more than 22 on the event day in Vilnius Stock Exchange, while after the merger Z_{Ut} are as high in Riga's Stock Exchange as well. This implies that news brings a lot of valuable information to the Latvian and Lithuanian stock markets. In general, large Z_{Ut} are common for small regional stock exchanges; Bartholdy, Olson, and Peare (2006) detected large Z_{Ut} for Copenhagen stock exchange as well. Furthermore, the results show that the possibility of insider trading, speculations or risk-averse investors trading is also much higher in the Vilnius and Riga Stock Exchanges than Tallinn. However, after VSE became a part of OMX group Z_{Ut} slightly decreased before the announcement day, meaning that possibility of insider trading also declined. Oppositely, the Z_{Ut} increased before the announcement day in 2004-2007 in Riga's Stock exchange, implying that the information leakages became much likelier. The Patell's standardized residual tests also show that the markets are affected for a long period in all three Baltic Stock markets. The improvements are seen in the Riga Stock Exchange, where the significant Z_{Ut} holds till the fifth day down from ninth after the event. While the significance of Z_{Ut} increased by one day - to nine days in Lithuanian stock exchange, and stayed the same (eight days) in Estonia. The other interesting factor is that Z_{Ut} s are significant still in a week's time (six days) in all Baltic stock exchanges for the second analyzed period, while in 2004 Sponholtz showed that in Denmark it holds maximum up to three – four days. Wael's (2004) analysis reveals that Z_{Ut} s are significant till the third day in the Euronext Paris. Furthermore, even earlier studies by Greene and Watts (1996) observed an immediate price adjustment to news announcements in NYSE and in the NASDAQ stock exchanges. The results and comparison with other stock markets imply that the information reaches investors comparatively very slowly and that the market is still inefficient.

Concerning the investors' reaction to "good" and "bad" news, each market exhibits slightly different trends. Still, high abnormal returns on the event day are observed in all three countries. Furthermore, the abnormal returns significantly decreased after the stock exchanges' consolidation, which shows that it is harder to win over the market after the stock exchange merger. Before the change of ownership of the stock exchanges, possible information leakages could be observed already on the fifth day before the "good" news announcement in Estonia and Latvia, while in Lithuania the significant Z_{BMPt} are observed on the fourth day before the news is posted. During the period 2004 – 2007, significant Z_{BMPt} are observed on the second and fifth days before the "good" news announcement in Estonia, while the situation did not change in Latvia. In Vilnius Stock Exchange the possible information leakages are observed on the third day instead of the fourth before the event day. Analysing the results after the event day, they are consistent with the previous test: positive significant returns in one-week time are observed in all three Baltic States, which once again indicates that the market efficiency did not improve after the consolidation took place.

Investors in all three stock markets react differently to the "bad" news. Even though they possess negative abnormal returns on the event day before the stock exchanges consolidated in all three markets, the significant Z_{BMPt} are observed only in Tallinn Stock Exchange before the mergers. The insignificant Z_{BMPt} s imply the semi-strong form market efficiency in the other two – Riga and Vilnius Stock Exchanges. On the other hand, significant Z_{BMPt} can be observed in a week's time in Vilnius, and three days later after the event in Riga, which could rather indicate slow reaction to the bad news. The small number of "bad" news could also cause these results. Furthermore, significant Z_{BMPt} can be seen in all three Baltic States on the event day after the stock exchanges merged, which shows that news do posses information in the most recent period, and markets react inefficiently. As for the period before the announcement day, possible information leakages are observed in all three markets. Possible insider trading or speculations can be seen for the more recent analysed period as well. In addition, the significant Z_{BMPt} and negative abnormal returns before the news announcement are observed in all three stock exchanges in the later period. In addition, in global stock exchanges information leakages before the news announcement are observed as well. Wong (2002) reckons that insider trading is very likely in U.S., Hong Kong, and China's stock exchanges.

Considering the graphical results for the third tests, the results are not that much surprising, since they reconfirm that none of the markets is semi-strong form efficient. However, Latvian and Lithuanian markets react weaker to the "good" news in the period after the merger, while Estonian market posses increasing CAR over the ten-day event window in the latter period. The same cannot be said about the reaction to the "bad" news, as Latvian and Estonian markets possess some developments and the overreaction is fixed faster. Investors can receive profits on short selling and earn profits in all event window after the news announcement, meaning that one borrows certain company's stocks from a broker and sells them on the market on the event day. The stocks should later be bought back in five days and returned to the initial owner to earn highest profits. On the other hand, the results for Latvia and Estonia should be cautiously analysed, as the sample for "bad" news is rather limited. In addition, Wael (2004) observed that investors react much faster to the "bad" news rather than "good" ones in Euronext Paris stock exchange.

To sum up, all three tests show significant abnormal returns on the event day in all the analysed markets for the both periods. The results also imply possible information leakages in the Baltic States, furthermore, the significance of the possible insider trading even increased after the OMX acquired the Baltic stock exchanges.

5. Conclusions

Using data set of the corporate news announcements in Baltic Stock Exchanges for 2001 - 2007, this study investigated whether the changes in the ownership structure of the analysed stock exchanges affected market efficiency by examining the behaviour of abnormal returns. It also determined the market efficiency form and whether the investors can make profitable trading strategies by addressing the difference in sensitivity of the stock prices to "good" and "bad" news events.

In Riga, Tallinn, and Vilnius Stock Exchanges Patell's Standardized Residual test indicates that news announcements have information content for both analysed periods, implying that there are relevant new information brought to the market. Furthermore, the tests indicated that the Baltic stock market stayed inefficient with respect to the news announcements even after the consolidation took place. The shortest reaction time is observed of five days in Latvia, indicating that the market is slow to react to new information. Furthermore, the test implies possible information leakages, speculations or risk-averse investors selling before the news announcement in all analysed stock markets. The significant Z_{Ut} are observed for a week or even more after the event announcement in Riga, Tallinn, and Vilnius Stock Exchanges.

The results received from the Patell's Standardized Residual test are consistent with the second - Boehmer, Musumeci and Poulsen (BMP) test. The latter analyses show that markets possess significant abnormal returns before the announcement day in all three stock exchanges. Significant positive average abnormal returns after the "good" news announcements are observed in all three markets for the both periods. However, the positive abnormal returns decreased after the merger, which could indicate that it is harder to get "big" profits after the merger. In addition, the possible positive average abnormal returns can be received even in a week's time in the Riga and Tallinn, while they are negative in Vilnius. The analyses of the event window related to the negative news imply possible information leakages in all three markets as well. Furthermore, the results signal possible market efficiency improvements in Estonia, as insignificant Z_{BMPt} on the event day are observed after the merger.

By simulating simple strategies I show that semi – strong market efficiency form does not hold in all three countries for both periods, since it is possible to earn abnormal returns by investing on event day, and selling some days later in the event window. Thus investors, have a lot of opportunities to exploit market inefficiencies and earn profits. However, the results implies that the scope of possible profits decreased in all the markets, with one exception – the Lithuanian stock market seems to provide more opportunities following the "bad" news announcement after the merge

In general, the outcomes from all the three tests show that there are no strong changes in the stock market efficiency form of in the Baltic Stock Exchanges due to the consolidation. All three countries seem to respond to the news in a similar way; still there are some small differences in the speed of investors' reaction to the news or the scope of the tests' significance. The results are noisy, so it is hard to make definite conclusions on them. There are some other issues that should be taken into account while considering the results. Firstly, there were cases when the results were posted in other sources earlier than in the stock exchange despite the legal restrictions. Secondly, the sample size for Latvia, and for the bad news in all three countries is very limited, meaning that Central Limit Theorem Statistics might be miss-specified. Thirdly, my assumption about the "good" and "bad" news might be not hundred percent correct, as the Baltic markets can be associated with high risk and possible high returns. Fourthly, I assumed that single index market model is correct for my analysis, which could be not always true. The method employed in this paper is only one of many ways to examine market's efficiency. Fifthly, event studies are considered the preferred method for the analysis of the event impact on the stock markets. However, the method could capture the abnormal returns by other external events previously defined as noise. As a consequence the research might not capture the effect of the event it intends. This likely problem is limited by the inclusion of a large number of events and the shorter event windows period. This research is only one step forward to study how the changes of ownership in the Baltic States affect markets.

Considering the present market efficiency form and possible trading strategies, one should take into account that Baltic stock exchanges are not very liquid and therefore the prices may move 10% or even more within a day. Furthermore, the liquidity squeeze is observed since the end of 2007. Even though this period is not taken into my analysis, the stock market is facing serious problems and the market efficiency is decreasing even more. Thus the simulation strategies might not be applied at the present, as the abnormal trading is observed. In addition, all investors who wish to invest in the Baltic market should follow the countries' macro economic situation. Since the Baltic States are considerably small economies, the macroeconomic situation can change quickly, which affects the companies listed on local exchanges and influences their share prices. In 2008 all three economies are facing economic recession and that could be observed in the stock market as well. In particular, the overheated Latvian and Estonian economies are decelerating markedly, which is caused mainly by the high inflation and weak lending practices.

There are a few issues I would like to address for further research of this topic. Firstly, Autoregressive Conditional Heteroskedastic model family (ARCH) has not been discussed in the study. Generalized Autoregressive Conditional Heteroskedastic model (GARCH) and Exponential Generalized Autoregressive Conditional Heteroskedastic model (EGARCH) has been recommended by a number of researches as a good method for market efficiency testing. Therefore, I also would like to apply GARCH and EGARCH into the further testing of the market. Another interesting study would be to analyse, how the exchange mergers have affected stock liquidity both in terms of abnormal returns and trading volumes. It would also be interesting to study how the transaction cost changed over time. By doing the above mentioned extensions, researchers would discover better motives for stock exchange mergers in the Baltic States.

References

- Ball, R., and P. Brown (1968). An empirical evaluation of accounting income numbers. Journal of Accounting Research 6: 159-177.
- Basdevant, O. and Kvedaras, V. (2002). Testing the Efficiency of Emerging Markets: the Case of the Baltic States, Working paper of Eesti Pank, 9.
- Bartholdy, J., Olson, D. and Peare, P. (2006). Conducting Event Studies on a Small Stock Exchange, Finance Research Group working paper series, F-2006-03.
- Beaver, W., (1968). The information content of annual earnings announcements. Journal of Accounting Research Supplement 6: 67-92.
- Bhattacharya, U., H. Daouk, B. Jorgenson and C. Kehr (2000). When an Event is not an Event: The Curious Case an Emerging Market. Journal of Financial Economics, 55: 69-101.
- Boehmer, E., J. Musumeci, and A.B. Poulsen, (1991). Event-study methodology under conditions of event-induced variance. Journal of Financial Economics 30, 253-272.
- Borjesson F., (2007). Short-term Post-Earnings Announcement Effects. Master Theses, Stockholm School of Economics.

Brandt, M., R. Kishore, P. Santa-Clara, and M. Venkatachalam, (2006). Earnings Announcements are Full of Surprises. Duke and UCLA, Working Paper.

Brennan, M. and A. Subrahmanyam, 1996. Market microstructure and asset pricing: On the compensation for illiquidity in stock returns. Journal of Financial Economics 41.

Brown, S., and J. Warner (1985). Using daily stock returns: The case of event studies. Journal of Financial Economics 14: 3-31.

Butkute, V. and Moscinskas, P. (1998). The Descriptive Analysis of the Securities Markets of the Baltic States. Journal of Monetary Studies, 4.

Chabot, B., (2000). A Single Market? The Stock Exchanges of the United States and London: 1866-1885. University of Michigan working paper.

- Chelley-Steeley, P.L. and Steeley, J. M., (1999). Changes in the Comovement of European Equity Markets. Economic Inquiry, Oxford University Press, vol. 37(3).
- Chelley-Steeley, P. L., J. M. Steeley and E. J. Pentecost (1998). Exchange controls and European stock market integration", Taylor and Francis Journals, vol. 30(2).

Cootner, P. (1964). The Random Character of Stock Market Prices. MIT Press.

Copé J. F., (2007). Stock Exchange Consolidation: What it means to listed companies. Tokyo Conference, December 2007.

Corhay, A., Rad A.T. and Urbain J.P. (1993). Common Stochastic Trends in European Stock Markets. Economics Letters, Vol. 42.

- Cowan A. R. and A. M.A. Sergeant, (1996). Trading Frequency and Event Study Test Specification. Finance 9610002, EconWPA.
- Domowitz, I., and B. Steil, (2002). Securities Trading. Technological Innovation and Economic Performance. Princeton University Press.
- Dubcovsky, G. and F. Venegas-Martínez, (2003). The Kalman Filter in the Event Study Methodology. Revista Mexicana de Economia y Finanzas, Vol.2, No.1, pp. 81-93, 2003
- Economides N. (1993). Network Economics with Application to Finance Financial Markets. Institutions & Instruments, vol. 2, no. 5, December 1993.
- The Economist (2008). Oceans Apart. 1 May 2008. Retrieved May 2, 2008, from: <u>www.economist.com</u>.
- Elliot, J., D. Morse, and G. Richardson (1984). The Association between Insider Trading and Information Announcements. Rand Journal of Economics, 15, 521-536.
- Fama, E. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. Journal of Finance, 25.
- Fama, E. (1991). Efficient Capital Markets II. Journal of Finance, 46.
- Fama, E., (1998). Market efficiency, long-term returns, and behavioral finance. Journal of Financial Economics 49: 283-306.
- Fama, E., L. Fisher, M. Jensen and R. Roll (1969). The adjustment of stock prices to new Information. International Economic Review 10.
- Financial Supervision Authority of Estonia (2002) Securities Market Act. 1 January 2002. Retrieved April 2, 2008, from: <u>http://www.fi.ee</u>.
- Fraser, P. and O. Oyefeso (2005). US, UK and European Stock Market Integration. Journal of Business Finance & Accounting 32(1–2).
- Harris, L., and Gurel, E. (1986), Price and volume effects associated with changes in the S&P500 list: new evidence for the existence of price pressures. Journal of Finance, Vol.41, pp 815-29.
- Hart, O., and J. Moore (1996). The Governance of Exchanges: Member's Cooperatives versus Outside Ownership. Oxford Review of Economic Policy, 12(4), 53.

Hussey, J. and Hussey, R. (1997). Business Research, Macmillan Press Ltd, Basingstoke.

Gajewski J. F. and Quéré B. P., (2001). The information content of earnings and turnover announcements in France. European Accounting Review, Taylor and Francis Journals, vol. 10(4).

- Greene, J. and S. Watts, (1996). Price discovery on the NYSE and the Nasdaq: The case of overnight and daytime news releases. Financial Management 25, no. 1, 19-42.
- Grossman, S. and J. Stiglitz (1980). On the Impossibility of Informationally Efficient Markets. American Economic Review, 70.
- Jarmalaite Pritchard N., (2002). The Relationship between Accounting Numbers and Returns in the Baltic Stock Markets. Centre for Economic Reform and Transformation, Heriot Watt University, CERT Discussion Papers 0206.
- Jeffrey F. and A. Rose (1996). "Currency Crashes in Emerging Markets: An Empirical Treatment," Journal of International Economics, Vol. 41 (November).
- Jensen, M. C., (1978). Some anomalous evidence regarding market efficiency. Journal of Financial Economics, Elsevier, vol. 6(2-3).
- International Federation of Stock Exchanges. (1997). Annual Report 1997. Retrieved 7 April 2008, from: <u>www.world-exchanges.org/</u>
- Investors Dictionary. (2008) Home page. Retrieved 28 April 2008, from: http://www.investordictionary.com/definition/abnormal+returns.aspx
- Kendall, M. (1953). The Analysis of Economic Time Series. Journal of the Royal Statistical Society. Series A, 96.
- Kiete K. and G. Uloza (2005). The Information Efficiency of Stock Exchanges in Lithuania and Latvia. Bachelor These. Stockholm School of Economics in Riga.
- Kim, J. S., F. Moshirian and E. Wu (2005). Dynamic stock market integration driven by the European Monetary Union: An empirical analysis", Journal of Banking & Finance 29.

Klimasauskiene, D. and Moscinskiene, V. (1998). Problem of the Efficiency of the Lithuanian Capital Market. Journal of Monetary Studies, 2.

- Kothari, S. and J. Warner (2005). Econometrics of Event Studies. Working Paper, Center for Corporate Governance, Tuck School of Business at Dartmouth.
- Latvian Financial and Capital Market (2003). Law on Financial Securities market. 11 December 2003. Retrieved April 2, 2008, from: <u>http://www.fktk.lv</u>
- Lithuanian Securities Commission (2002). Disclosure of information by public limited companies in Lithuania. Retrieved April 2, 2008, from: <u>http://www.lsc.lt</u>
- Lithuanian Securities Commission (2002). Law on Securities Market. No. I-1169.1 April 2002. Retrieved April 2, 2008, from: <u>http://www.lsc.lt</u>
- McAndrews J. and C. Stefanadis, (2002). The consolidation of European stock exchanges. Current Issues in Economics and Finance, Federal Reserve Bank of New York.

- MalkamAki, M. (1999). Are there Economies of Scale in Stock Exchange Activities? Bank of Finland Discussion Papers. Retrieved April 7, 2008, from: www.bof.fi/en/julkaisut/tutkimukset/keskustelualoitteet/index.htm
- Maynes, E. and J. Rumsey (1993). Conducting Event Studies with Thinly Traded Stocks. Journal of Banking and Finance, 17: 145-157.
- Meulbroek L.K. (1992). An Empirical Analysis of Illegal Insider Trading. Journal of Finance, 47(5), 1992, 1661-1701
- Mihailov, T. and Linowski, D. (2002). Testing Efficiency of the Latvian Stock Market: An Evolutionary Perspective. . Retrieved April 7, 2008, from: http://ssrn.com/abstract=302285.
- Milieska G. (2004). The Evaluation of the Lithuanian Stock Market with the Weak-form Market Efficiency Hypothesis. Bachelor Dissertation, Østfold University College. . Retrieved April 7, 2008, from: <u>http://www.e-m-h.org</u>.
- Miller, D. (1996). Why do foreign firms list in the United States? An empirical analysis of the depositary receipt market. University of California at Irvine working paper.
- NASDAQ OMX Group. (2006). Monthly report Share turnover by company. Retrieved 28 April, 2008, from: http://www.omxgroup.com/nordicexchange/Themarket/Statisticsanalysis/Equities/mo nthlyreportshareturnoverbycompany/
- Nielsson U., (2007). Interdependence of Nordic and Baltic Stock Markets. Baltic Journal of Economics 6(2)/2007.
- Osborne, M F M (1959). Brownian Motion in the Stock Market. Operations Research, 7.
- Pagano, M. (1989). Trading Volume and Asset Liquidity. Quarterly Journal of Economics 104, no. 2.
- Pagano, M., Randl, O., Röell, A., and Zechner, J., (2001). What Makes Stock Exchanges Succeed? Evidence from Cross-Listing Decisions. CEPR Discussion Papers 2683, C.E.P.R. Discussion Papers.
- Patell, J., (1976). Corporate forecasts of earnings per share and stock price behavior: Empirical tests. Journal of Accounting Research 14: 246-276.
- Peterson, P. (1989). Event Studies: A Review of Issues and Methodology. Quarterly Journal of Business and Economics, 1989, 28(3), 36–66.
- Reilly, F. and Brown, K. (2003). Investment Analysis & portfolio Management. New Jersey : South-Western.
- Rendleman, R. J., Jones, C. P., & Latane, H. A. (1982). Empirical anomalies based on unexpected earnings and the importance of risk adjustment. Journal of financial economics 269-287.

- Roberts, H. (1959). Stock Market `Patterns' and Financial Analysis: Methodological Suggestions. Journal of Finance, 44.
- Roberts, H. (1967). Statistical Versus Clinical Prediction of the Stock Market. Unpublished paper, Chicago: University of Chicago.
- Sarkar, A., and Li K. (2002). Should U.S. Investors Hold Foreign Stocks? Federal Reserve Bank of New York Current. Issues in Economics and Finance 8, no. 3.
- Schmiedel, H., (2001). Technological development and concentration of stock exchanges in Europe. Bank of Finland Discussion Papers. Retrieved April 7, 2008, from: www.bof.fi/en/julkaisut/tutkimukset/keskustelualoitteet/index.htm
- Schmiedel, H., M. Malkamaki, and J. Tarkka (2002).Economies of scale and technological development in securities depository and settlement systems. Bank of Finland Discussion Papers. Retrieved April 7, 2008, from: www.bof.fi/en/julkaisut/tutkimukset/keskustelualoitteet/index.htm
- Schredelseker, K. (2002). Grundlagen der Finanzwirtschaft. Ein nformationsökonomischer Zugang. Wien München: Oldenbourg.
- Sponholtz, C. (2004). The Information Content of Earnings Announcements in Denmark. University of Aarhus, CAF, Working Paper n. 177. Retrieved 28 April, 2008, from: <u>http://ssrn.com/abstract=554422</u>
- Steil, B. (2001). Borderless Trading and Developing Securities Markets. Paper presented at the World Bank, International Monetary Fund, and Brookings Institution Third Annual Financial Markets and Development Conference, April.
- Taylor, M.P. and Tonks I. (1989). The Internationalization of Stock Markets and The Abolition of U.K Exchange Control. Review of Economics and Statistics, Vol. 71, pp. 332-36.
- Jegorova, R. (2007). Nubausta "Finasta". Vilniaus Zinios, 15 November 2007. Retrieved 2 May 2008: <u>www.vz.lt</u>
- Wael, L., (2004). Market reaction to annual earnings announcements: the case of Euronext Paris, Working Paper, Gerem, Université de Perpignan.
- Wong E. (2002). Investigation of Market Efficiency: An Event Study of Insider Trading in the
Stock Exchange of Hong Kong. Stanford University, May 2002. Retrieved 20 March
2008,
from:http://www-
http://www-
econ.stanford.edu/academics/Honors_Theses/Theses_2002/honors_theses_2002.html
- Working, H. (1934). A Random Difference Series for Use in the Analysis of Time Series. Journal of the American Statistical Association, 29.
- World Federation of Exchanges (2005). Cost and Revenue Survey 2005, Retrieved 29 March, 2008, from : <u>http://www.worldexchanges.com</u>

6. Appendices (1)

Background data on Tallinn's, Riga's, and Vilnius' Stock Exchanges

6.1. Table 5. OMX ownership in the Baltic Market in 2008

Stock exchange	Ownership
Riga Stock Exchange (RSE)	62%
Latvian Central Depository	100% owned by RSE
Tallinn Stock Exchange (TSE)	93%
Estonian CSD	100% owned by TSE
Vilnius Stock Exchange (VSE)	93%
Central Securities Depository of Lithuania	32% owned by OMX, 8% owned by VSE

Source: NASDAQ OMX Group, 2008

6.2. Table 6. Baltic Stock Exchanges review (2000-2007H1)

	2000	2001	2002	2003	2004	2005	2006	2007H1
Tallinn Stock								
Exchange								
Market capitalization	1915	1704	2386	3117	4706	2961	4578	5229
(MEUR)						_,		• /
Market capitalization of							1363.0	1419.2
free float (MEUR)								
Market turnover (MEUR)	348.6	259.0	263.6	494.0	663.0	1938.0	766.0	791.2
Number of companies	21	18	15	15	14	16	16	17
Number of IPOs			1	205.0	2261	3	2	2
Average company size	91.2	94.7	159.1	207.8	336.1	185.1	286.1	307.6
(MEUR) Madian free float (MEUP)							16.1	60.0
Market cap (% of GDP)	31.4%	24.6%	30.8%	36.7%	50.2%	26.8%	35.0%	34.0%
Market turnover (% of	18.2%	15.2%	11.0%	15.8%	14.1%	65.5%	16.7%	15.1%
market cap)	1012/0	10.270	111070	101070	1	001070	101770	1011/0
Market turnover (% of	5.7%	3.7%	3.4%	5.8%	7.1%	17.5%	5.9%	5.1%
GDP)								
Riga Stock								
Exchange								
Market capitalization	676	784	682	776	1208	2177	2034	2192
(MEUR)								
Market capitalization of							328.7	375.0
free float (MEUR)								
Market turnover (MEUR)	243.4	153.6	126.4	125.5	87.2	76.8	87.7	62.6
Number of companies	63	63	62	56	39	45	40	42
Number of IPOs	10.7	10.4	11.0	12.0	1	40.4	50.0	52.2
Average company size	10.7	12.4	11.0	13.9	31.0	48.4	50.9	52.2
(MEUR) Madian free float (MEUP)							0.8	0.8
Market cap (% of GDP)	8.0%	8 4%	6.9%	7.8%	10.8%	17.0%	12.6%	11.2%
Market turnover (% of	36.0%	19.6%	18.5%	16.2%	7.2%	3.5%	4.3%	2.9%
market cap)		-,,						,,,
Market turnover (% of	2.9%	1.6%	1.3%	1.3%	0.8%	0.6%	0.5%	0.3%
GDP)								
Vilnius Stock								
Exchange								
Market capitalization	1232	964	1392	2862	4753	6937	7728	8697
(MEUR)								
Market capitalization of							1159.7	1251.7
free float (MEUR)								
Market turnover (MEUR)	119.3	226.5	176.4	165.6	314.0	588.0	1607.0	453.4
Number of companies	47	46	51	43	42	43	42	42
Number of IPOs	26.2	21.0	27.2	(((112.2	161.2	104.0	
(MELIP)	20.2	21.0	27.5	00.0	115.2	101.5	184.0	207.1
(MEUR) Median free float (MEUR)							12.4	14 3
Market cap (% of GDP)	10.0%	7.1%	9.3%	17.4%	26.2%	33.6%	32.5%	32.5%
Market turnover (% of	9.7%	23.5%	12.7%	5.8%	6.6%	8.5%	20.8%	5.2%
market cap)								
Market turnover (% of	1.0%	1.7%	1.2%	1.0%	1.7%	2.9%	6.8%	1.7%
GDP)								

Source: NASDAQ OMX Group, 2008

Investments in Estonian securities (MEUR)					
Residents	6 137.6	60.1%			
Institutional	5 295.9	51.9%			
Households	841.6	8.2%			
Non-residents	4 076.4	39.9%			
Total	10 214.0				
Investments in Latvi	an securities (MEUR	R)			
Residents	848.9	52.4%			
Institutional	624.2	38.6%			
Households	224.7	13.9%			
Non-residents	770.2	47.6%			
Total	1 619.1				
Investments in Eston	ian securities (MEU	R)			
Residents	7 452.1	59.0%			
Institutional	6 040.5	47.8%			
Households	1 411.6	11.2%			
Non-residents	5 186.6	41.0%			
Total	12 638.7				
Source: NASDAQ OMX	Group, 2008				

6.3. Table 7. Investor profile in the Baltic Stock Exchanges (June 30, 2007)

6.4. The Baltic Market offer:

- Easy remote access through pan-Baltic membership
 - Efficient cross-border trading and settlement
 - A common trading system
 - A single access point to Baltic local markets (Tallinn, Riga and Vilnius)
 - o Harmonized market practices and rules
 - Delivery-versus-payment (DVP) link between the Baltic central securities depositories
 - Free-of-payment (FOP) link between the Baltic central securities depositories
- One market information source
 - Common securities lists
 - o Common indexes and harmonized local indexes
 - Common market data website www.omxgroup.com/nordicexchange/balticmarket
 - One market data package for vendors

Source: NASDAQ OMX Group, 2008

6.5. Pan-Baltic settlement link for stock exchange transactions

- An investor with a securities account in Estonia/ Latvia/Lithuania can easily buy and sell securities in any of the three countries
- An investor interested in buying securities in one of the neighboring countries no longer needs to open a new account in the country in question
- Payments are made in local currency (EEK in Estonia, LVL in Latvia, LTL in Lithuania); the cash-leg in foreign currencies is settled via commercial banks (EUR and USD)
- One common clearing and settlement time schedule for Baltic stock exchanges transactions. A market specific time schedule remains for Latvian tradable government bonds
- Stock exchange transactions are settled via cross-border DVP
- Cross-border FOP transfers and OTC DVP transactions are available to all account operators and account managers of the Baltic CSDs

Source: NASDAQ OMX Group, 2008

	"Good" events	"Bad" events	Total
Estonia (2001-2004)	75	39	114
Latvia (2001-2004)	55	28	83
Lithuania (2001-2005)	183	114	297
Estonia (2004-2007)	96	29	125
Latvia (2004-2007)	103	51	154
Lithuania (2005-2007)	216	102	318

6.6. Table 8. Summary of events analyzed

7. Appendices (2)

Lithuania

Event day		2001-2005				2005-2007		
-	EW	/P	CW	P	EW	EWP		/P
	Z	AR	Z	AR	Z	AR	Z	AR
-10	-0,362	-0,001	-0,942	-0,001	0,059	0,001	0,249	0,001
-9	0,768	0,001	0,043	0,003	-0,189	0,000	0,177	0,001
-8	1,092	0,001	0,869	0,002	-1,059	-0,001	-1,396	-0,002
-7	-0,047	0,001	-1,186	-0,002	-1,527	0,002	-0,478	0,000
-6	-0,587	-0,001	-0,767	-0,001	0,782	-0,002	0,861	0,001
-5	-0,701	-0,002	-1,305	-0,001	0,431	0,002	0,029	0,001
-4	-1,703*	-0,003	-2,409**	-0,002	-0,249	0,000	0,089	0,001
-3	-0,168	-0,003	-1,937	-0,003	2,113**	0,004	1,905*	0,004
-2	0,927	0,001	0,737	0,001	0,446	0,001	0,396	0,000
-1	-0,879	-0,001	-0,697	-0,001	-0,413	0,000	-0,850	-0,001
0	2,487**	0,009	2,426**	0,010	2,498**	0,006	2,275**	0,006
1	-0,008	0,001	0,617	0,001	-0,462	-0,002	-0,171	-0,001
2	-0,075	0,000	-0,544	0,001	-0,832	-0,001	-1,836	-0,002
3	0,411	0,001	0,134	0,001	-1,163	-0,001	-0,724	0,000
4	1,589	0,003	1,066	0,003	-0,123	0,001	-0,549	0,000
5	-1,601	-0,003	-1,714*	-0,002	-1,478	-0,001	-1,629	-0,001
6	0,393	-0,001	-0,871	0,000	-0,574	-0,001	-1,100	-0,002
7	-0,060	-0,002	-1,001	-0,001	-0,228	-0,001	-0,230	-0,002
8	0,983	0,001	1,470	0,003	0,269	0,000	-0,147	0,000
9	-0,693	-0,001	0,653	0,001	-0,156	0,001	-1,183	-0,001
10	-0,111	-0,001	-0,212	0,000	-0,229	-0,001	0,425	0,000

Table 9. Results of the Standardized Cross-Sectional Test for the "good" news

Notes: The table presents the test statistic Z_{BMPt} for Lithuania in two periods before merger and after. In the first period it contains 183 events and in the second period it contains 216 events. See the list of abbreviations for legends.

Event day		2001	-2005			2005-2007			
-	EV	VP	CV	VP	EW	P	CW	P	
	Z	AR	Z	AR	Z	AR	Z	AR	
-10	-0,207	0,001	0,966	0,003	-0,028	0,003	0,889	0,003	
-9	0,378	0,001	-0,258	0,001	0,548	-0,002	-0,181	-0,002	
-8	0,528	0,001	0,314	0,001	-1,028	0,000	-0,838	0,000	
-7	0,470	0,000	-0,234	0,000	0,025	0,001	0,179	0,001	
-6	0,488	0,001	0,079	0,001	-0,872	-0,001	-0,740	-0,001	
-5	-0,797	-0,002	-0,903	-0,002	-0,786	-0,001	-0,436	-0,001	
-4	-1,165	-0,002	-1,723*	-0,002	2,923***	0,007	3,005***	0,007	
-3	1,797*	0,004	1,061	0,003	-1,163	-0,005	-2,173**	-0,005	
-2	2,456*	0,005	0,998	0,003	1,404	0,001	0,516	0,001	
-1	-0,002	0,000	-0,442	-0,001	-0,766	-0,004	-1,267	-0,004	
0	1,147	0,002	0,390	0,002	-2,332**	-0,011	-2,622**	-0,011	
1	-0,989	-0,004	-1,183	-0,002	-2,265**	-0,010	-2,548**	-0,010	
2	-0,905	-0,002	-0,346	0,000	-1,994**	-0,009	-2,600**	-0,009	
3	0,629	0,003	1,242	0,004	-0,216	-0,003	-0,543	-0,003	
4	-0,805	-0,002	-0,589	-0,001	-1,421	-0,003	-1,188	-0,003	
5	1,796*	0,005	1,693*	0,005	-0,768	-0,001	-0,506	-0,001	
6	-0,726	-0,001	-0,077	0,000	0,953	0,002	0,848	0,002	
7	0,925	0,003	1,070	0,004	0,975	0,002	0,655	0,002	
8	0,224	0,001	0,972	0,002	0,910	0,001	0,263	0,001	
9	-0,369	0,000	-0,351	0,001	-0,092	0,000	-0,406	0,000	
10	-0,052	-0,003	-0,796	-0,001	0,132	0,001	0,468	0,001	

Table 10. Results of the Standardized Cross-Sectional Test for the "bad" news

Notes: The table presents the test statistic Z_{BMPt} for Lithuania in two periods before merger and after. In the first period it contains 114 events and in the second period it contains 102 events. See the list of abbreviations for legends.

Event day	2001-2005 EWP		2005 E	5 - 2007 EWP
	CAR	Z	CAR	Z
1	0,009	8,277***	0,006	4,220***
2	0,010	8,265***	0,004	3,474***
3	0,011	8,793***	0,004	2,077**
4	0,011	8,631***	0,002	-0,086
5	0,014	10,911***	0,003	-0,523
6	0,011	9,831***	0,002	-3,917***
7	0,009	10,094***	0,001	-5,486***
8	0,008	10,063***	0,000	-6,215***
9	0,009	10,775***	-0,001	-5,383***
10	0,008	10,168***	0,001	-5,919***
11	0,003	7,153***	0,000	-6,643***

Table 11. CAR Test Results for the "good" news in Lithuania

Notes: The table presents the test statistic Z_{Ut} for Lithuania in two periods before merger and after. In the first period it contains 183 events and in the second period it contains 262 events. See the list of abbreviations for legends.

Table 12. CAR Test Results for the "bad" news in Lithuania

Event day	200	1-2005	2005	5 - 2007
	E	VVP		
	CAR	Z	CAR	Z
1	0,002	3,750***	-0,009	-4,000***
2	-0,002	1,824*	-0,018	-6,602***
3	-0,004	1,266	-0,024	-8,243***
4	-0,001	1,711*	-0,025	-8,358***
5	-0,003	1,305	-0,029	-9,018***
6	0,002	2,263**	-0,030	-9,372***
7	0,000	1,888*	-0,028	-8,976***
8	0,003	2,236**	-0,025	-8,596***
9	0,004	2,482**	-0,022	-8,276***
10	0,004	2,279**	-0,021	-8,315***
11	0,001	2,270**	-0,022	-8,274***

Notes: The table presents the test statistic Z_{Ut} for Lithuania in two periods before merger and after. In the first period it contains 88 events and in the second period it contains 102 events. See the list of abbreviations for legends.
8. Appendices (3)

Latvia

Table 13. Results of the Standardized Cross-Sectional Test for the "good" news

Event day		2001·	-2004			2004	-2007	
-	EV	VP	CV	VP	EW	Ρ	CW	P
	Z	AR	Z	AR	Z	AR	Z	AR
-10	0,329	0,001	0,336	0,002	0,181	0,001	0,704	0,010
-9	-0,538	-0,004	-0,370	-0,004	0,494	0,001	0,503	-0,003
-8	-0,773	-0,004	-0,727	-0,003	0,489	0,001	-0,405	-0,005
-7	-0,418	-0,002	-0,859	-0,004	0,870	0,001	0,589	0,000
-6	-0,634	-0,001	-1,183	-0,002	-0,877	-0,001	-1,667	0,001
-5	1,730*	0,006	1,615	0,006	-1,443	-0,002	-0,903	0,019
-4	-0,688	-0,002	-0,377	-0,002	-0,129	0,000	-1,188	-0,028
-3	-0,181	-0,001	-0,308	0,000	-0,096	0,001	-0,993	-0,001
-2	0,999	0,004	1,250	0,005	1,286	0,003	-0,107	0,000
-1	0,478	0,002	0,145	0,002	0,293	0,001	-0,405	-0,002
0	1,925*	0,010	1,898*	0,010	3,220***	0,009	2,988***	0,009
1	0,295	-0,001	0,258	-0,003	1,132	0,003	0,934	0,003
2	-0,661	-0,002	-0,056	0,001	-1,175	-0,002	-1,044	-0,002
3	0,314	-0,002	0,288	-0,001	-0,199	-0,001	-1,662	-0,003
4	0,733	0,003	0,759	0,003	-0,204	-0,001	-0,664	-0,002
5	0,857	0,002	1,073	0,002	-0,941	-0,002	0,183	0,012
6	-0,546	-0,005	-1,466	-0,007	-0,452	0,000	-0,394	-0,001
7	1,764*	0,008	1,753*	0,008	1,667*	0,003	0,297	-0,011
8	0,662	0,002	0,454	0,000	0,902	0,001	0,839	0,001
9	0,919	0,004	1,484	0,008	-0,489	-0,002	0,077	0,012
10	0,718	0,004	1,277	0,006	-0,383	0,000	-1,281	-0,016

Notes: The table presents the test statistic Z_{BMPt} for Latvia in two periods before merger and after. In the first period it contains 55 events and in the second period it contains 103 events. See the list of abbreviations for legends.

Event day		2001-2005				2005-2	2007	
-	EW	P	CW	P	EWI	Р	CWP	
_	Z	AR	Z	AR	Z	AR	Z	AR
-10	-1,516	-0,006	-2,102**	-0,008	-0,262	-0,001	1,243	0,072
-9	1,318	0,006	1,295	0,004	0,127	0,000	-1,516	-0,043
-8	-0,051	-0,002	-0,726	-0,006	0,809	0,002	-0,886	-0,028
-7	-0,576	-0,001	-0,391	0,000	-0,209	0,000	-1,891	-0,007
-6	-1,518	-0,003	-1,649	-0,002	1,198	0,003	-0,086	0,000
-5	-0,081	-0,001	-0,131	-0,002	-1,260	-0,002	-1,920	-0,003
-4	1,103	0,005	1,106	0,004	0,100	0,001	-1,120	-0,003
-3	-2,938**	-0,022	-2,882**	-0,024	0,567	0,002	-0,713	-0,001
-2	-0,785	-0,002	-1,742	-0,002	-1,134	-0,002	-1,482	-0,003
-1	0,694	0,001	1,587	0,005	1,331	0,005	0,382	0,001
0	-1,345	-0,010	-1,602	-0,011	-2,878***	-0,011	-2,665**	-0,011
1	-0,611	-0,003	-1,296	-0,008	-1,744*	-0,006	-1,901*	-0,008
2	0,383	-0,001	-0,376	-0,004	0,661	0,003	0,499	0,002
3	-2,358**	-0,009	-1,769*	-0,010	0,543	0,001	0,463	0,001
4	-1,518	-0,004	0,324	-0,001	-1,121	-0,004	-1,433	-0,006
5	1,014	0,002	0,816	-0,003	-0,301	-0,002	-0,754	-0,004
6	-0,078	-0,001	0,128	0,001	0,377	0,002	-0,445	0,000
7	-1,274	-0,005	-1,275	-0,005	-0,021	0,000	0,593	0,001
8	-0,064	-0,003	0,500	-0,002	0,698	0,002	0,121	0,001
9	-1,176	-0,011	-0,890	-0,010	1,019	0,004	0,157	0,001
10	-0,537	-0,008	-0,665	-0,010	0,006	0,000	-1,617	-0,005

Table 14. Results of the Standardized Cross-Sectional Test for the "bad" news

Notes: The table presents the test statistic Z_{BMPt} for Latvia in two periods before merger and after. In the first period it contains 28 events and in the second period it contains 51 events. See the list of abbreviations for legends.

Event day	2001-2004 EWP		2004 E	4 - 2007 EWP
	CAR	Z	CAR	Z
1	0,010	2,538**	0,009	5,895***
2	0,009	2,786***	0,012	7,162***
3	0,007	2,473**	0,010	6,374***
4	0,005	2,744***	0,009	6,297***
5	0,008	3,118***	0,008	6,212***
6	0,010	3,460***	0,006	5,800***
7	0,005	3,201***	0,006	5,614***
8	0,013	4,111***	0,009	6,194***
9	0,015	4,378***	0,011	6,475***
10	0,019	4,635***	0,009	6,338***
11	0,023	4,809***	0,009	6,220***

Table 15. CAR Test Results for the "good" news in Latvia

Notes: The table presents the test statistic Z_{Ut} for Latvia in two periods before merger and after. In the first period it contains 55 events and in the second period it contains 103 events. See the list of abbreviations for legends.

Table 16. CAR Test Results for the "bad" news in Latvia

Event day	2001-2004 EWP		2004 - 2007 EWP	
	CAR	Z	CAR	Z
1	-0,010	-1,245	-0,011	-4,725***
2	-0,012	-1,608	-0,017	-6,294***
3	-0,014	-1,447	-0,015	-5,789***
4	-0,023	-2,242**	-0,014	-5,375***
5	-0,027	-2,609**	-0,018	-5,968***
6	-0,026	-2,134**	-0,020	-6,122***
7	-0,027	-2,184**	-0,019	-6,007***
8	-0,032	-2,654**	-0,019	-6,012***
9	-0,035	-2,676**	-0,017	-5,825***
10	-0,047	-3,215***	-0,012	-5,479***
11	-0,055	-3,396***	-0,013	-5,477***

Notes: The table presents the test statistic Zu_t for Latvia in two periods before merger and after. In the first period it contains 28 events and in the second period it contains 51 events. See the list of abbreviations for legends.

9. Appendices (4)

Estonia

Event day	2001-2004			2004-2007				
-	EW	Έ	CV	VP	EW	Р	CW	Р
	Z	AR	Z	AR	Z	AR	Z	AR
-10	-1,172	-0,004	-0,351	-0,003	-0,821	-0,001	-0,491	0,000
-9	2,162**	0,005	1,953*	0,008	-0,917	-0,002	-0,111	0,001
-8	-2,213**	-0,008	-1,838*	-0,006	-3,281***	-0,006	-3,192***	-0,006
-7	0,320	0,002	1,252	0,006	-0,305	-0,001	-0,248	-0,001
-6	0,700	0,002	0,711	0,004	-1,202	-0,002	-0,638	-0,001
-5	2,116**	0,004	0,643	0,003	2,059**	0,003	2,106**	0,004
-4	-1,597	-0,004	-1,625	-0,003	0,063	0,001	0,691	0,004
-3	1,651	0,005	1,175	0,006	1,752*	0,005	2,435**	0,004
-2	2,201**	0,004	-0,101	0,002	-1,559	-0,003	-1,392	-0,003
-1	-1,238	-0,004	-0,828	0,000	0,948	0,002	0,212	0,001
0	2,887***	0,010	2,369**	0,014	2,163**	0,007	2,176**	0,007
1	-1,072	-0,003	-1,468	-0,001	-0,098	0,000	-0,216	-0,001
2	0,545	0,003	0,491	0,004	0,585	0,000	1,053	0,002
3	1,165	0,001	1,130	0,002	-0,182	0,001	-1,250	-0,003
4	-1,192	-0,001	-1,020	0,002	-0,460	-0,003	-0,431	0,000
5	1,928*	0,004	1,391	0,006	1,483	0,004	0,544	0,001
6	-1,219	-0,003	0,764	0,002	0,498	0,002	0,401	0,000
7	-1,025	-0,002	-0,838	0,001	1,689*	0,004	1,924*	0,003
8	-0,140	0,000	-0,520	0,001	0,199	0,000	0,671	0,001
9	-0,513	-0,001	-1,022	0,002	0,383	0,001	0,580	0,002
10	1,869	0,006	0,012	0,008	-0,522	-0,002	-1,248	-0,003

Table 17. Results of the Standardized Cross-Sectional Test for the "good" news

Notes: The table presents the test statistic Z_{BMPt} for Estonia in two periods before merger and after. In the first period it contains 75 events and in the second period it contains 96 events. See the list of abbreviations for legends.

Event day		2001-2005				2005-	·2007	
-	EWP		CWP		EW	Р	CW	Р
_	Z	AR	Z	AR	Z	AR	Z	AR
-10	1,299	0,005	0,726	0,004	0,917	0,002	0,353	0,001
-9	1,120	0,001	1,591	0,004	0,658	-0,001	2,148	0,004
-8	0,401	0,003	0,568	0,005	0,303	-0,001	0,554	0,002
-7	0,485	0,001	-0,661	0,001	-0,257	-0,002	-0,231	-0,002
-6	-0,949	0,000	-0,741	0,001	0,289	0,016	-0,522	-0,003
-5	2,091**	0,005	2,363**	0,009	-0,800	-0,005	-0,730	-0,001
-4	-1,419	-0,005	-2,077**	-0,007	1,242	0,021	2,571	0,010
-3	-0,077	-0,002	-0,686	-0,001	-0,160	-0,006	0,246	-0,003
-2	-1,019	-0,002	-0,291	0,000	-0,395	0,003	-0,395	0,003
-1	0,604	0,003	0,201	0,004	-0,852	-0,006	-0,917	-0,006
0	-1,846*	-0,005	-2,131**	-0,006	-0,794	-0,007	-0,628	-0,005
1	-0,227	-0,002	-0,281	-0,002	0,682	0,011	1,038	0,013
2	0,907	0,000	0,847	0,001	-0,579	-0,006	-0,524	-0,004
3	0,448	0,000	0,527	0,001	-2,804***	-0,008	-2,870***	-0,006
4	-0,024	0,000	0,645	0,003	-0,295	0,004	-0,532	0,005
5	1,024	0,004	1,085	0,008	-0,369	-0,004	0,512	0,000
6	-0,300	0,000	0,734	0,003	1,675*	0,004	1,789*	0,007
7	-0,663	-0,001	-0,056	0,000	-0,934	0,000	-1,606	-0,004
8	-0,028	0,003	0,482	0,003	-0,376	-0,003	-0,356	-0,002
9	0,415	0,001	-0,699	0,000	-0,455	0,003	-0,340	0,003
10	-0,094	0,001	-0,628	-0,002	0,865	0,004	0,470	0,002

Table 18. Results of the Standardized Cross-Sectional Test for the "bad" news

Notes: The table presents the test statistic Z_{BMPt} for Estonia in two periods before merger and after. In the first period it contains 39 events and in the second period it contains 29 events. See the list of abbreviations for legends.

Event day	2001-2004 EWP		2004 E	4 - 2007 WP
	CAR Z		CAR	Z
1	0,010	4,512***	0,007	2,817***
2	0,008	3,595***	0,007	2,739***
3	0,010	3,887***	0,007	3,010***
4	0,011	4,381***	0,008	2,882***
5	0,010	3,728***	0,005	2,675***
6	0,014	4,493***	0,009	3,522***
7	0,011	4,032***	0,011	3,781***
8	0,009	3,702***	0,014	4,405***
9	0,009	3,660***	0,015	4,478***
10	0,008	3,492***	0,016	4,593***
11	0,014	4,121***	0,014	4,450***

Table 19. CAR Test Results for the "good" news in Estonia

Notes: The table presents the test statistic Z_{Ut} for Estonia in two periods before merger and after. In the first period it contains 75 events and in the second period it contains 96 events. See the list of abbreviations for legends.

Table 20. CAR Test Results for the "bad" news in Estonia

Event day	2001-2004		2004 - 2007		
	E	WP	EWP		
	CAR	Z	CAR	Z	
1	-0,005	-2,065*	-0,007	-1,161	
2	-0,007	-2,305**	0,003	-0,318	
3	-0,007	-1,765*	-0,003	-0,685	
4	-0,006	-1,522	-0,011	-2,079*	
5	-0,006	-1,532	-0,008	-2,289**	
6	-0,003	-1,107	-0,012	-2,363**	
7	-0,003	-1,204	-0,008	-1,483	
8	-0,004	-1,395	-0,007	-1,743*	
9	-0,001	-1,402	-0,011	-1,864*	
10	0,000	-1,311	-0,007	-1,953*	
11	0,001	-1,337	-0,003	-1,839*	

Notes: The table presents the test statistic ZUtfor Estonia in two periods before merger and after. In the first period it contains 39 events and in the second period it contains 29 events. See the list of abbreviations for legends.