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SHORT RUN MOMENTUM AND STOCK MARKET EFFICIENCY. CASE STUDY OF THE BALTIC STATES

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Abstract

This paper aims to explore the short run momentum effect across the Baltic stock exchanges. This is the first attempt to carry out a research of such a type in this region, as no similar studies have been yet documented or observed. However, short run momentum effect has been widely investigated by various researchers across many different capital markets during the last decade or two. Methodology of this research paper is based on the fundamental work in this field carried out by Jegadeesh, and Titman. The idea behind the short run momentum effect is to form portfolios of stocks looking at their past performance and going long in best the stocks (called winners), while shorting the worst ones (losers). Results prove that short run momentum effect is present at Baltic stock exchanges, and that there is a possibility for stock market participants to earn excess returns using trading strategies based on the phenomenon. Analysis of possible sources of momentum returns reveals the fact that short run momentum effect is not due to market inefficiency related factors. Satisfactory liquidity level at the time of portfolios formation and realization proves that it is possible to exploit short run momentum financial anomaly in practice, which stands out as the main practical contribution of this research paper.

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1. Introduction

The short run momentum effect is a financial markets anomaly observed empirically across stock exchanges around the world. In brief, looking at short time horizons (3-12 months) “winners” stock portfolios, composed of the best performing stocks of the past (3-12 months), tend to over-perform market index, though according to the classic finance theory earning abnormal returns should not be possible when using past information about prices. Several competing finance theories have been developed to explain this anomaly; however, none of them has been fully supported by the empirical findings. Due to these reasons we find the short run momentum phenomenon as a challenging area for our research, the results of which might give valuable hints both to private and institutional investors of the Baltic stock markets.

It should be noticed that this thesis is the first attempt to explore the short run momentum effect in the Baltic stock markets. Due to the fact that Baltic capital markets can be classified as emerging, study of these stock exchanges offers us a unique possibility to observe the changes in the short run momentum effect over the development of the capital markets (becoming more efficient). If the development of the effect shows any trend over time, it would allow us to get a clue about the relationship between the effect and market efficiency, which has been of high interest in the studies of other authors. In order to be able to investigate the link between the short run momentum effect and the efficiency of the stock exchanges, firstly, the presence and the magnitude of the short run momentum effect in the Baltic stock markets (Lithuanian, Latvian, and Estonian) will be investigated. Furthermore, if our research allows us to conclude that these effects are present, the methodology of Jegadeesh, and Titman will be employed to empirically identify the possible determinants of the phenomenon (1993, 84). Moreover, we will explore the development of the effect over time. If any trend is present, the explanation using the theories will be employed in order to see if it can be connected to the changes in the market efficiency of the Baltic stock markets. Finally, in order to determine if it is possible to employ momentum trading strategy in reality, we investigate the largest obstacle for application faced in the Baltic stock exchanges – low liquidity of the traded shares. Such a planned fieldwork will allow us to answer the following questions:

1. Is there an autoregressive process, which is needed for short run momentum effect to exist, present on the Baltic stock exchanges?

2. If the effect is present, how big is its size?

3. In the Baltic stock exchange case, is the effect a result of market inefficiency:

a) Can a short run momentum be explained by the efficient market theory – constantly picking up stocks which have a relatively high volatility and thus a higher return as a reward for this volatility?

b) Development of the effect over time – influence of the increasing efficiency of the markets on the size of effect.

4. Is the liquidity of selected stocks high enough to be able to apply momentum trading strategies in the real life?

The remaining part of the paper is structured as following: section 2 presents the review of relevant literature, section 3 describes data and introduces methodology used in the research, section 4 delivers the obtained results and analysis, and finally section 5 concludes the paper.

2. Review of literature

Short run momentum effect has been a hot topic in the modern classical and behavioral finance for over a decade now, since the appearance of the pioneering article in this field written by Jegadeesh, and Titman (Jegadeesh, Titman, 1993). A lot of empirical research has been done in order to identify the presence of this effect not only in USA, but also across other stock markets in the world. In this section of the thesis the findings of the most prominent works researching the short run momentum effect will be listed out together with the most sound behavioral finance theories, which have been developed in order to explain the existence of the effect, presented. Additionally, the findings, methodology and approach of the paper of Jegadeesh and Titman, which stands as the basis of our research, will be described in more detail.

To begin with, many of the research papers analyzing the short run momentum effect concentrate solely on the USA stock market. The majority of works does not only discover the presence of the effect, but also tries to explain it with different influential variables, like industry effect, and other. For instance, Moskowitz and Grinblatt claim that industry effect is the main and the only cause for the occurrence of the short run momentum anomaly (1999, 1276). Moskowitz and Grinblatt in their paper argue that as industry momentum effect can not be fully explained by the microstructure effects, individual stock momentum, or cross-sectional dispersion in mean returns, it must stand as a sound explanation of the short run momentum effect. Next, Lo and MacKinlay present three different possible sources of momentum profits in their research paper. They claim that the stock which has recently (3-12 months) performed well relative to other stocks, might continue to do so, because it might possess a higher unconditional mean compared to other stocks, or it might have positively correlated returns, so that its past returns predict its future returns; or, thirdly, stock's return might be negatively correlated with other stock's lagged returns, so that their poor performance automatically indicates higher future returns of the particular stock (1990, 197). However, Lo and MacKinlay are short in finding any serious economic explanations for the short run momentum effect and rely only on statistical evidence. Still, the findings of Lo and MacKinlay seem to support Jegadeesh article, which has found a statistically significant positive and higher than first order serial correlation between stock returns – an obvious proof rejecting random walk hypothesis (attributing the findings to the existing inefficiency in the market, or to the systematic changes in expected stock returns), and might count as another explanation for short run momentum anomaly (1989, 893). To be more precise, Jegadeesh

finds the size of monthly abnormal returns of extreme deciles stock portfolio amounting to 2.49% (time series of 1934-1987). Next, in one of their research papers Jegadeesh and Titman analyze the source of abnormal short run momentum trading strategies returns and come to the conclusion that these profits occur mainly due to a stock price overreaction to firm specific information, and that only the small friction of the excess profits appear due to lead lag effects in stock returns (delay of reaction to common factors) (1995, 986). Furthermore, Cooper, Gutierrez, and Hameed uncover more intriguing facts about the short run effect in yet another academic paper dealing with this anomaly. After having tested overreaction hypothesis of short-run momentum and long-run mean reversal, the authors come to a conclusion that excess momentum returns depend on the state of the market. Looking at their sample from years 1929 to 1995 the average momentum profits above the market (on monthly basis) following positive market returns amount to 0.93%, compared to -0.37% after a downside in the market. Moreover, Cooper, Gutierrez, and Hadeem also reach the conclusion that macroeconomic factors cannot explain momentum profits. (2004, 1358). Furthermore, other papers try to explain the short run momentum effect while constructing models based on various macroeconomic indicators. The most prominent of such works is the paper by Chordia and Shivakumar, which, as it is claimed by the authors, succeeds in attributing a set of different macro-variables based on business cycles to help explain the short run momentum anomaly (2002, 1012). To be more precise, macroeconomic factors like the dividend yield on the market, default spread, term spread, and the yield on short term bonds explain part of the momentum profits. In addition to that, one of the most recent articles by Jegadeesh, and Titman examines short run momentum effect in the time series of 1990-1998, and concludes that the anomaly is still present in NYSE, and on average “winners” portfolio outperforms the equally weighted market index by 0.56 monthly percentage points, whereas “losers” portfolio underperforms the market index by 0.67 monthly percentage points (2001, 714). This evidence proves, that the findings of the pioneering Jegadeesh, and Titman article about short run momentum effect have not occurred due to time series bias, and also that the momentum profits almost equally consist of both “winners” portfolio beating the market, and “losers” portfolio losing to the market index. In the next paragraph not only the main findings of the papers about the short run effect anomaly will be described, but also the competing behavioral finance theories and other hypotheses, which have been developed in order to explain the effect will be outlined. It is important to note that the majority of these theories are based on various psychological attributes, which makes it difficult to test the validity of the models.

To begin with, the first major work, which has tried to model the short run momentum effect, has been written by Kent, Hirshleifer, and Subrahmanyam (1998, 1871). This article presents the overreaction theory, based both on psychological biases and behavioral finance effects. In short, the theory is based on psychological biases of investors: overconfidence about private information and biased self-attribution. Due to these factors investors tend to overreact to private information signals (due to overconfidence in one's ability to value securities), and under-react to public information (due to self attribution bias in light of overreacting to private information signals, and under-reacting to public information signals), which causes stocks to depart from their fundamental values in the short run. However, in the long run prices finally correct to their fundamental values, which causes so called long run mean reversal effect. Therefore, overreaction theory is one of the frameworks explaining both short run momentum and long run mean reversal effects. To sum up, psychological biases allow Kent, Hirshleifer, and Subrahmanyam to attribute the positive auto-correlations of stock returns to the continuing investor's overreaction, which is finally corrected to fundamental values in the long run. Another view is presented in Hong and Stein article, which introduces the under-reaction theory as the model explaining the existence of the short run momentum anomaly (Hong, 1999, 2172). Authors of the paper argue that under-reaction theory is based on two groups of rational agents: 'newswatchers' and 'momentum traders'. 'Newswatchers' possess private information, but fail to extract it from prices. This information diffusion causes prices to under-react in the short run. On the other hand, 'momentum traders' are able to profit from under-reaction effect by trend-chasing. However, Hong and Stein also reach the same conclusion as the Kent, Hirshleifer, and Subrahmanyam - prices are corrected in the long run in the form of long run mean reversal effect. Last but not least, one more hypothesis about the short run momentum effect is presented in the paper by Amihud and Mendelson (1986, 226). In this paper authors develop the liquidity hypothesis, which argues that stocks with lower trading volume experience larger momentum returns. On the other hand, stocks with higher trading volume tend to experience lower momentum returns.

In this section several articles, which have analyzed the short run momentum effect in other than USA stock markets, will be reviewed. Firstly, Rouwenhorst has examined 12 different European stock markets within time span of 1980-1995 (1998, 275). Rouwenhorst constructs internationally diversified "winners" and "losers" portfolios and finds that on average "winners" portfolio beats the "losers" portfolio by 1% per month. Also short run momentum effect has been found to be present in all 12 examined stock markets across

Europe. This article was one of the first to support Jegadeesh, and Titman findings about the presence of short run momentum anomaly in USA stock market. Strong correlation between momentum investing strategies in European and USA stock markets only supports the claim that these findings have not occurred by chance.

A research paper written by J. van der Hart and others, investigates momentum effect in emerging markets, and comes to a conclusion that both emerging market risk, and global risk factor (including market, book to market, size and momentum factors) cannot explain the excess returns earned by employing the momentum investment strategies (2005, 254). Authors find support for both under-reaction and over-reaction behavioral theories for momentum trading strategies, which in part supports the evidence from developed markets. In short, authors do not find any support for risk based explanations of excess returns earned by momentum strategies; however they find supportive evidence for behavioral under-reaction and overreaction theories. Along with other trading strategies, the profitability of 6 month momentum trading strategy is examined, and 0.36% average monthly excess return is earned using this strategy. Time series analyzed ranges from 1989 to 2004, thus in order to be able to draw some comparison with the results in this research paper, it would be more precise to take a look at average excess returns during 1999-2004 – 0.43% (t-value 2.16).

After having reviewed the most influential academic articles in the field of behavioral finance, which especially deals with the problem of short run momentum anomaly, we will now turn to the Jegadeesh and Titman paper which stands as the theoretical and methodological basis of our research paper. First of all, it is necessary to briefly mention that the article of Jegadeesh and Titman 'Returns to buying "winners" and selling "losers": implications for stock market efficiency' has become the most influential paper in the field of short run momentum anomaly research, as it has been the basis of almost every other article about short run momentum effect written later. The strong sides of Jegadeesh and Titman paper are the following: clearly identified methodological approach, well argued construction of models, and plausible assumptions behind them. Moreover, apart from behavioral finance theories, this article concentrates more on relating short run momentum effect to the possible inefficiency gaps on the market, and as far as the investigation of Baltic stock market's efficiency is an important part of our paper, it is rational to follow the basic methodology used by Jegadeesh, and Titman. Due to the above mentioned reasons, this article will also stand as the main theoretical and methodological ground of our paper.

In the following paragraph the findings of the article by Jegadeesh, and Titman will be briefly outlined. Using a six month forming and holding strategy a yearly abnormal return of

longing “winners” portfolio, and shorting “losers” portfolio gives a return of 12.01%. Furthermore, after testing for the possible sources of momentum profits, the conclusion is reached that they come from neither lead lag effects, nor are they caused by systematic risk factors of the stocks. It is argued that the main part of abnormal returns is coming from the serial correlation in the firm-specific information. Extension of the holding period to 36 months shows diminishing abnormal returns for “winners” over “loser’s” portfolio in the second and third holding years. A similar pattern is traced when the portfolios are formed around the earning announcement dates.

In order to give a better insight on the methodology employed by Jegadeesh and Titman in their study, the main steps of their analysis (formation of portfolios, testing of hypotheses, analysis of results, and other) will be described in greater detail in the following paragraphs, and also in the methodology part. A point worth mentioning is that Jegadeesh, and Titman construct their “winners”/”losers” portfolios in a way to get 16 different trading strategies, where both holding and formation periods vary from 3 to 12 months (4 different periods) forming a 4*4 portfolio matrix. All 16 trading strategies document short run momentum effect, whereas the strategy of formation period equal to 12 months, and holding period set to 3 months seems to be the most successful one, yielding 1.31% excess monthly return on average.

3. Data and methodology

3.1. Data

To begin with, the methodology used by previous short run momentum researchers is based on the analysis of listed companies’ stocks returns. As a result, in order to answer previously stated research questions we perform an analysis of the stock price returns of the companies listed in the Baltic stock exchanges (Vilnius, Riga, and Tallinn stock exchanges).

Due to limited data availability, we exclude companies which were delisted during the history of the stock markets and include only enterprises present on the exchanges at the time of the research (January 2007). Such a choice creates a sample of 71 companies to be analyzed – 43 Lithuanian, 11 Latvian, and 17 Estonian ones. As far as the prices needed to derive returns of the stocks are concerned, historical dividend adjusted weekly closing price of a share obtained from the REUTERS database is used. Using weekly quotes instead of daily ones still provides with large number of observations but also allows avoiding price fluctuations related to the bid-ask spread or price pressure effects which are considered by Jegadeesh (1990) and Lehmann (1990, 23) as a source of possible bias.

Weekly closing price quotes are available since as early as 1996 for some companies, however there are enterprises which were put into the list only in the middle of 2006 (e.g. Vilkyškių Pieninė, Eesti Ehitus). As a result, in total almost 25.000 observations of weekly stock prices are obtained. Before proceeding with the calculation of weekly returns, prices are checked and adjusted for any unusual movements caused by the share splits or mergers.

In addition to the stock price returns, daily quotes of OMX Baltic Benchmark General Index, which is used as a proxy of market return, are obtained from the official site of OMX stock exchange operator.

3.2.Methodology

In the same way as previous researchers (Antoniou, 2005, 73), continuously compounded returns are calculated for each stock using the following formula:

$$r_{i,t} = \ln\left(\frac{S_{i,t}}{S_{i,t-1}}\right), \qquad (1)$$

where $r_{i,t}$ is a compounded return for a stock i in a time t , $S_{i,t}$ and $S_{i,t-1}$ are i^{th} stock prices at time t and $t-1$ respectively.

As far as econometric tools employed to answer our research questions are concerned, we use Ordinary Least Squares regression with heteroskedasticity robust standard errors to draw reliable conclusions about the relationships between selected variables. To be sure that a correct functional form of each regression is used, residuals of a linear regression (used as a default functional type) will be analyzed (residuals correlated with the independent variable would signal that a different function should be used).

The first research question of our paper asks if conditions for a short run momentum effect to exist are present in the Baltic stock markets. The essential phenomenon which is needed for profitable momentum strategies to exist (thus for momentum effect to exist too) is the autoregressive process present in the stock prices (lagged values of returns should explain current return). In order to identify if such process is present, we test the following regression:

$$\bar{r}_{i,t+f} = \beta_0 + \beta_1 \bar{r}_{i,t-s} + \varepsilon, \qquad (2)$$

where $\bar{r}_{i,t+f}$ is the average return of individual stock during selected length period (f) after time t (e.g. if 12 weeks (3 months) length is selected, then $\bar{r}_{i,t+f}$ will be average of 12 weeks returns starting with a week $t+1$ and ending with a week $t+3$), $\bar{r}_{i,t-s}$ is the average return of

the same stock during previous *s* periods (up to previous 12 months) before time *t*. β_0 is an intercept and ε is an error term. Using average values instead of single returns allows us to escape possible bias associated with such a short period between observations as one week – comparing relationship only between single returns would rather identify random fluctuations instead of revealing short run trend, which is the fundament of momentum strategies (short run trend is incorporated in the average return of several weeks). Moreover, no any control variables are used, however, the purpose of the regression is only to see if previous earnings alone have predictive power and can be used by investors to form profitable strategies. If obtained factor loading β_1 has a positive sign and is statistically significant, it would mean that previous average high returns predict future average high returns – evidence that short run momentum might be present in the capital market. Regression is repeated for different lengths of periods (different *s* and *f*), as autoregressive process might differ depending on the lag size.

After identifying the presence of conditions necessary for the short-run momentum effect to exist in the Baltic stock markets, it is essential to measure the size of it. Though it is possible to evaluate the strength of the effect by the size of β_1 from previous regressions (higher coefficient would signify stronger autoregressive process and thus stronger momentum), such a measurement has low practical usage and applicability. An alternative and more popular way of measurement of the effect was firstly suggested by Jegadeesh and Titmann (1993). These researchers created investment strategies based on the short-run momentum effect and saw if positive profits can be achieved. The size of the profit is an economic measurement of the magnitude of the effect. Identically, in our research we also use momentum trading strategies suggested by Jegadeesh and Titmann (1993) to form investment portfolios out of the stocks listed on the Baltic stock exchanges.

It should be pointed out that in order to obtain reliable results on the momentum profits, large pool of stocks has to be analyzed, as stocks are divided into sub-groups according to their past performance. Not sufficient number of stocks in each sub group would not allow testing statistical robustness of the momentum returns.

Methodology used to create the investment strategies is almost the same as the one suggested by Jegadeesh and Titmann (1993). If short run momentum effect is present, when going long on the previous winners and short on the previous losers should create a zero value investment portfolio generating positive returns. Stocks are selected according to their performance in previous *J* months and held in the portfolio for *K* months. After *K* months

return of the portfolio is measured. Choosing 3, 6, 9 or 12 months of previous performance and holding securities for 3, 6, 9 or 12 months creates 16 investment strategies to be evaluated. As far as the precise way of portfolio creation is concerned, at each period *t* all the stock present in the markets at that time are ranked in an ascending order according to their performance over previous *J* periods (cumulative return of periods starting at *t-J* and ending at t-1). Based on these ranking the deciles portfolios containing equally weighted stocks are constructed – the first portfolio has 10% of the stocks which were the worst performers, second has 10% of the stocks which were performing better and so on. The 1st deciles is called "losers" and the last one "winners". In each period *t* strategy buys "winners" portfolio and sells "losers" portfolio and holds the position for *K* periods. Identically as Jegadeesh and Titmann, in order to obtain larger number of observations and thus increase power of the upcoming tests, the strategies use overlapping holding periods – at time *t* not only "winners" and "losers" selected at *t* are held, but also the "winners" and "losers" selected at time *t-1*, *t-2*, till *t-K*, the last period whose portfolio is still in the investment stage, are held. However, it should be noted that return of the portfolio at time *t* is not affected by these 'pending' "winners" and "losers" – r_t is generated by selling position of "winners" and "losers" formed at *t-K*.

Despite the same principles used in our research and by Jegadeesh and Titmann (1993), there are some differences in the formation of the investment strategies. To be more precise, Jegadeesh and Titmann (1993) use one month as a unit interval (after 1 month another selection of "winners" and "losers" is performed). In our case, one week is selected as a unit interval. Such a choice enables generation of higher number of observations and thus increases power of the statistical tests (Jegadeesh and Titmann base the research on the sample of stock price movements over 24 years, but data for Baltic stock markets is available only for maximum 10 years). In addition to that, as relatively large pool of stocks has to be analyzed and subdivided in order to obtain large enough deciles, when forming a portfolio, we consider all the Baltic stock markets as a single united exchange. If countries are analyzed separately, in Estonian case which has only 12 public listed companies, we would obtain deciles with only one stock in it, which would result in biased estimates of momentum profits. Due to the same aim of analyzing as big and complete array of information as possible, in the momentum investment strategies formation and analysis stage of this paper we analyze only period of 2000-2006 during which most of the companies currently present on the exchanges were already listed.

After the array of returns of the momentum strategies is generated, average returns together with the t-statistics values are calculated. The average return is a variable identifying the size of the effect.

The last group of the research questions tries to draw conclusions about the relationship between Baltic stock market efficiency and short-run momentum. In order to identify if momentum profits are created by the processes in coherence with efficient stock market assumption, analysis of the sources of momentum profits firstly suggested by Jegadeesh and Titmann (1993, 72) is performed. This time in all the tests returns of one representative strategy (which results in the largest momentum profits) is used (e.g. the one there J=6 months and K=6 months).

According to Jegadeesh and Titmann, if one-factor model describing stock returns is used ($r_{it} = \mu_i + b_i f_t + e_{it}$, where μ_i is unconditional expected return on security i, f_t is unconditional expected return on factor mimicking portfolio (market portfolio formed by equally-weighting all the stocks), b_i is a stock i return's sensitivity to the market portfolio return (similar as beta used in CAPM model) and e_{it} is firm specific component of return at time t), the sources of the momentum profits, can be described by the following equation:

$$E\left\{(r_{it} - \overline{r_t})(r_{it-1} - \overline{r_{t-1}})\right\} = \sigma_\mu^2 + \sigma_b^2 Cov(f_t, f_{t-1}) + \overline{Cov_i(e_{it}, e_{it-1})}, \quad (3)$$

where left hand side of the equation is equal to the expected profit of a trading strategy extremely closely related to the momentum strategies described above. As far as the right hand side of the equation is concerned, σ_μ^2 and σ_b^2 are cross sectional variances of expected stock returns and factor sensitivities (beta's) respectively. As authors argue, the first term in the right hand side of the equation is the cross-sectional dispersion. The intuition behind is that realized past returns have a component related to the expected return, thus stocks which are performing well in present time are likely to perform well in the future too – stocks are characterized by constant high return due to bearing systematic risk (high beta stocks). The second is the strategy's ability to selectively react to the returns of market portfolio – if strategy selects stocks with high betas when expected market returns are high (e.g. when market is growing) and low beta shares when market expectation is low, it should result in positive momentum profits. If source of the momentum profits is either the first or the second part of the right hand side of the expression, it means that returns are the compensation for bearing the market risk and thus does not signal market inefficiency. However, if the last part of the expression (serial covariance of the idiosyncratic part of the stock return) is the most

important source of momentum profits, it would mean that stock market is inefficient, as it suggests that returns are compensation for company specific risk, which, according to efficient market theory, is cancelled out and is not compensated.

In order to test if momentum profits are compensation for holding higher risk stocks, we calculate the average betas of "winners" and "losers" portfolios described in the strategy formation part. If the zero-cost portfolio (long in "winners" and short in "losers") has a significantly high beta, it would mean that profits are compensation for risk.

To analyze if the second term (serial covariance of factor mimicking portfolio) is important source of the profits, the serial covariance of equally weighted index returns needs to be positive. In order to test this, the covariance is calculated.

Finally, in order to see if the third term (related to market inefficiency) is important for momentum profits, covariance of market model residuals for individual stocks ($Cov_i(e_{it}, e_{it-1})$) has to be calculated. If covariance is positive, it means that stocks are under reacting to firm specific information (past information is affecting current prices) and thus create momentum profits – these profits then most likely are resulted by market inefficiency. The negative covariance would signify that stock prices overreact to firm specific information and adjust for this overreaction (decrease in price) in short run, thus decreasing strength of momentum profits.

However, Jegadeesh and Titmann (1993) also argue that despite already described 3 sources, it is possible that momentum profit can be created due to lead-lag effect – stock prices reacting to the changes in a factor mimicking portfolio with a lag. To test if lead-lag effect is causing momentum profits, stock returns have to be described by a different model, taking into account lagged factor value ($r_{it} = \mu_i + b_i f_t + b_i f_{t-1} + e_{it}$, the additional variable f_{t-1} is the lagged value of the market portfolio return). In such a model environment the importance of lead-lag effect can be tested using the following regression:

$$r_{pt,s} = \alpha_i + \theta r_{mt,-s}^{\ 2} + u_{it}, \quad (4)$$

where $r_{pt,s}$ is the *s* month return of a momentum investment strategy formed at month *t* and based on *s* month lagged returns. $r_{mt,-s}$ is the demeaned return on the value weighted market index in the months *t-s* through *t*-1 (s is the length of the lag of the representative momentum profit strategy). In order for lead-lag effect to be important for momentum profits, coefficient next to the squared market return variable has to be positive. Otherwise lead-lag effect is not important.

Finally, in addition to the above described analytical tests trying to see if momentum profits are result of market inefficiency, we use some other methods available to us due to exceptionality of the Baltic stock exchanges. To be more precise, some researchers argue that the market efficiency in the Baltic States has significantly developed during the last 15 years (Kvedaras and Basdevant (2002)). As a result, exploring development of the momentum profits over time can allow drawing some conclusions about market efficiency and momentum profits. To test the development over time, the following regression is used:

$$r_t = \beta_0 + \beta_1 t + \varepsilon \text{ , (5)}$$

where r_t is a return of a representative momentum investment strategy at time t. If a coefficient next to the variable *t* is negative, it means that over time (then market gets less inefficient) momentum profits are decreasing, thus suggesting that momentum profits are the phenomena caused by market inefficiency. If coefficient is insignificant (equal to 0) or positive, it would imply that decreasing inefficiency is not affecting or increasing the size of the effect – identification that return is caused by factors not related to the market inefficiency.

3.3. Possible delisted companies bias

Methodological point which deserves additional analysis is the choice to exclude from the research companies which were delisted from stock markets during the period of analysis. Excluding delisted companies from the analysis should not significantly affect the reliability of our results. Firstly, it should be noticed that one of the main reasons for the delisting in the Baltic stock markets is low liquidity. Privatization process in the Baltic States has created artificially high number of listed companies, part of these being completely uninteresting for the investors and thus characterized by extremely low liquidity. During the evolution of the Baltic capital markets, most illiquid companies were taken out of the exchanges in order to increase overall effectiveness and attractiveness of the stock markets. If a share is showing low liquidity, its price is not likely to change at all, or changes are fractional (if nobody is trading the stock, there are no demand and supply forces which could affect stocks price). However, in momentum trading strategies, which are analyzed in this paper, only the stocks with biggest price increases and decreases (winners and losers) are examined. The average performers, or stocks showing no change in price at all, are ignored. Thus it could be stated, that excluding from the analysis stocks which are characterized by small price movements (thus low liquidity stocks too), should not affect overall results of the research at all. Besides low liquidity, the second fundamental and common reason for delisting is the bankruptcy of

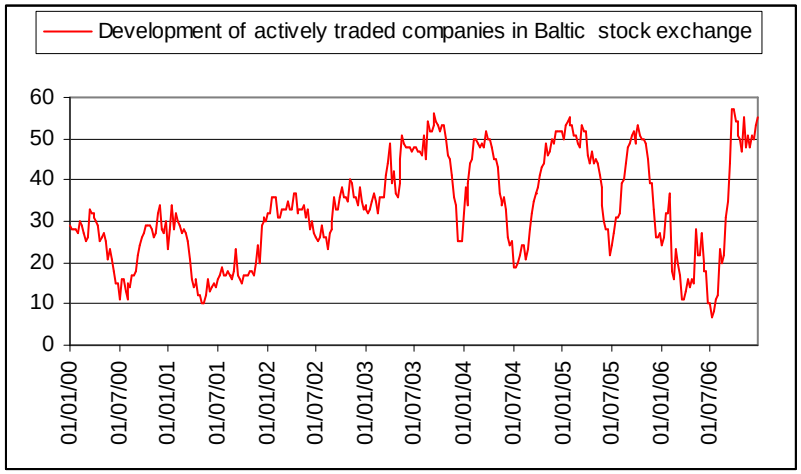
the issuer (a recent example in the Baltics was the bankruptcy of AB Ekranas in 2006). In such a case, bankruptcy is usually preceded by a long period of company's financial stagnation, which is reflected in steadily decreasing prices of the shares. Due to strong negative performance, companies on the edge of bankruptcy would be included as "losers" in the momentum trading strategies. As bankruptcy process itself has a momentum (after the first signals of insolvency, price is showing long period of constant decrease), inclusion of delisted companies would strengthen the momentum effect. Thus when measuring the effect, it should be kept in mind that results might be downwardly biased. However, since in the formation of the strategy not a single stock, but 10% of all listed companies (one decile) are included into losers' portfolio, bias created by excluded bankrupting company should be small.

3.4.Market background

For the purpose of momentum effect analysis, OMX Baltic market is investigated in this research paper. Thus it might be useful to provide the reader with a brief introduction to the market and its specifics. To begin with, united Baltic stock market was established in 2001, as a part of OMX group, which currently runs and manages stock exchanges across 7 countries (Scandinavia and Baltic markets).

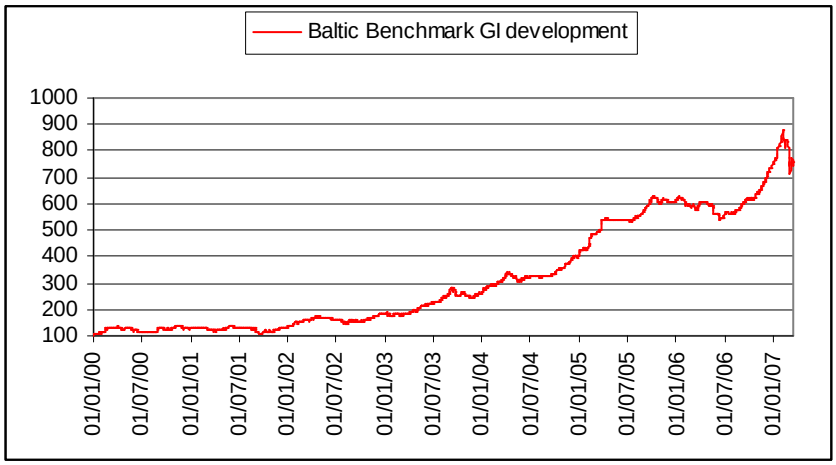
At the moment (March 2007) 42 companies are listed and traded in Vilnius stock exchange, 15 companies in Tallinn, and 11 companies in Riga stock exchange (http://www.baltic.omxgroup.com).

In order to illustrate how the Baltic Stock market developed, it is important to take a look at the number of traded companies at a certain point in time. Graph 1, depicts the number of actively traded companies in the Baltic Stock exchange during 2000-2006. It is interesting to note, that the number of companies traded each day has not been increasing steadily, but rather with many ups and downs. Overall, the increase of actively traded companies each day in the Baltic Stock exchange can be attributed to the development of the market, increasing number of investors, and increasing global investors' interest in the Baltic listed companies.



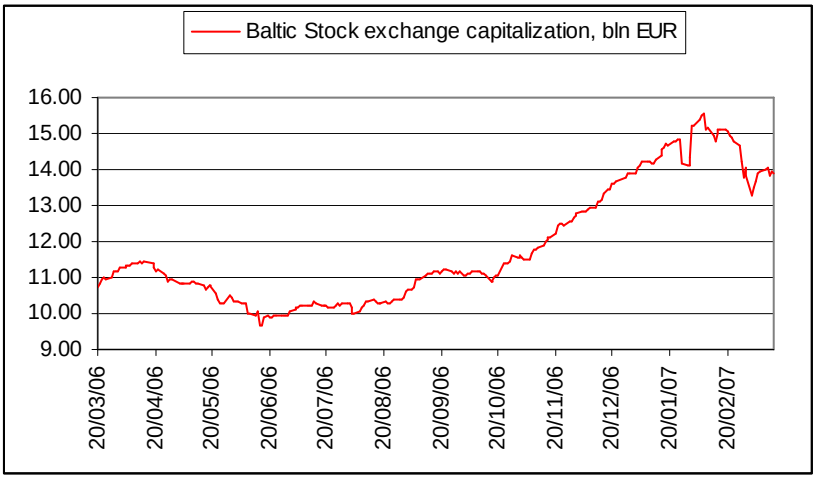
Graph 1. source: www.omxgroup.com

Furthermore, general market index development might indicate whether the market is bull or bear, or both. For this purpose, OMX Baltic Benchmark General Index is investigated. From the graph below it can be clearly seen, that Baltic stock market can be described as a purely bull market, where stocks have appreciated in a total of more than 756% since 2000 (Graph 2).



Graph 2. source: www.omxgroup.com

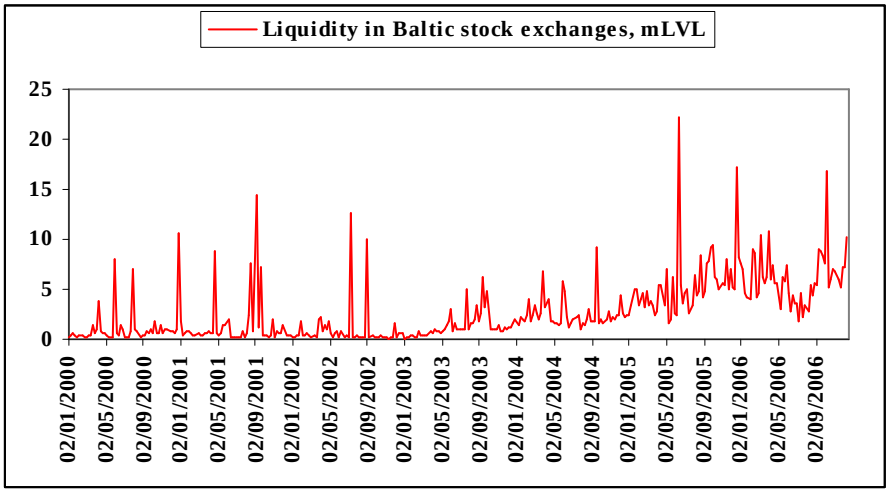
In order to determine the size of the market, a look at the average capitalization will be taken. During 2000-2007 the market has been growing rapidly, and market capitalization is amounting up to more than 13.8 billions euros at the time this paper is written (see Graph 3).



Graph 3. source: www.omxgroup.com

As the development of the overall effectiveness of a stock exchange is closely related to the liquidity of the market, historical weekly liquidity levels in Baltic stock exchanges are depicted in the Graph 4 below. One can observe the increasing level of market liquidity over

time, with several peaks and downs. Thus it can be stated that over time Baltic stock exchanges became more efficient in the sense of liquidity levels.

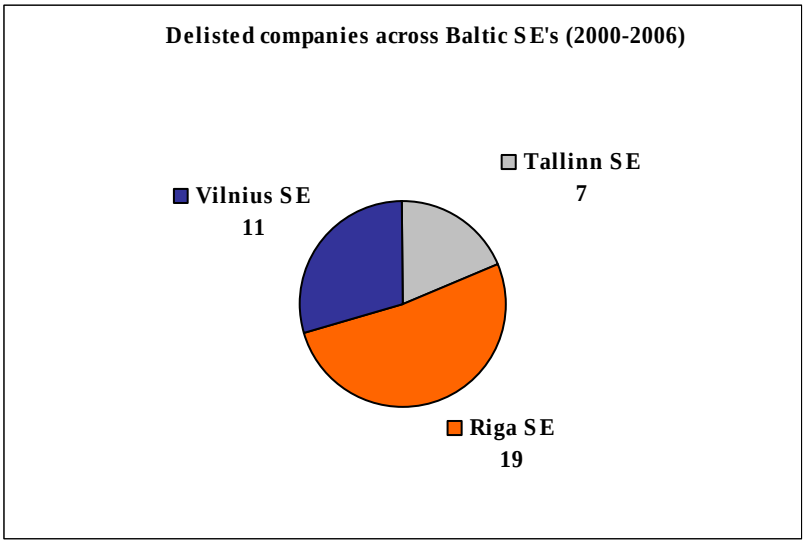


Graph 4. source: www.omxgroup.com

Our statistic sample excludes companies from the Baltic stock exchanges which were delisted due to low liquidity, bankruptcy and other issues during the period 2000-2006. Nevertheless, a brief presentation of those companies gives a better insight, how Baltic stock exchanges have been developing during the period.

In total 37 companies were delisted from the Baltic stock exchanges during 2000-2006. The majority of them come from Latvia – 19, followed by 11 companies from Lithuania, and 7 from Estonia (Graph 5). Detailed list of the companies can be found in the appendixes at the end of this research paper (Appendix 1).

It might be interesting to note that yearly number of delisted companies has been quite steady during 2000-2004, however, afterwards stock exchanges experienced one year with no companies delisted at all, and 2006 seemed to be a year of compensation with 10 delisted companies (Table 1).



Graph 5. source: self composed.

Year	Number of companies delisted
2000	5
2001	6
2002	7
2003	5
2004	4
2005	0
2006	10
Total	**37**

Table 1. source: self composed.

The possible reasons for delisting companies from stock exchanges vary from case to case. However, across the Baltic States the majority of reasons lies with the decisions of company shareholders, bankruptcy (Ekranas case), or company being unable to fulfill the requirements for listing on the stock exchange - violating regulation standards and/or failing to meet financial specifications set by the corresponding stock exchange.

To sum up, all the statistics point to the positive direction concerning the development of the Baltic stock market, as the number of listed and actively daily traded companies, market capitalization, Baltic Benchmark GI index, and market liquidity levels have been all rapidly increasing over time. Rapid development of this emerging market has made it attractive for research purposes, and due to above mentioned reasons companies from Baltic stock market have been chosen as the sample for the momentum effect analysis.

4. Results and analysis

4.1. Predictive power of past returns

As presented in the previous part of this research paper, in order to see, if past returns have any predictive power in explaining future returns (if autoregressive process is present), regression analysis with average future returns as dependent variable and average past returns as independent variable is used. Regression coefficients of past returns together with corresponding t-statistics are presented in the table below.

		Average past returns (regressor)			
Average future returns		**3 months**	**6 months**	**9 months**	**12 months**
	3 months	0.0641809 (6.28)	0.0437015 (2.78)	0.0825213 (4.52)	0.1015743 (4.46)
	6 months	0.0259153 (3.07)	0.0318925 (2.79)	0.0777257 (5.26)	0.1023507 (5.43)
	9 months	0.0260419 (3.92)	0.0393858 (3.90)	0.0905412 (6.72)	0.1075569 (6.95)
	12 months	0.0251173 (4.02)	0.0502971 (4.55)	0.0813658 (6.56)	0.087089 (6.52)

Table 2: Regression coefficients of the past returns (t-statistics presented in parenthesis)

As it can be seen from Table 2, obtained coefficients of the average past returns are positive and highly significant in all regressions (the smallest t-value of 2.78 is obtained in 6 month-6 month regression, which suggests that there is smaller than 0.5% probability that coefficient is equal to 0). Positive sign of all coefficients implies that previous positive returns can predict positive future returns and previous negative returns, correspondingly – negative future returns. As a result, it should be possible to create profitable momentum trading strategies by using high past returns as an identifier of high future returns.

4.2. Trading strategies

Average monthly returns for all strategies (t-values)				
-\+	**T3**	**T6**	**T9**	**T12**
T3	0.004962 (2.968125)	0.001763 (1.716066)	0.001814 (2.138363)	0.00213 (2.878102)
T6	0.001538 (1.072706)	0.001222 (1.175337)	0.002224 (2.64898)	0.002756 (4.250947)
T9	0.004468 (3.678814)	0.003602 (3.934191)	0.003107 (4.472133)	0.002838 (5.221101)
T12	0.005151	0.004805	0.004260	0.003561

	(3.799309)	(5.553988)	(6.756961)	(6.031455)

Table 3. source: self composed.

Formation of portfolios (going long in past winners and short in past losers) provides 16 different investment strategies. To be more precise, time series used for formation of portfolios range from 2000-2006. Such a choice of time series allows unbiased formation of portfolios, as before 2000 the number of actively traded companies in Baltic Stock Exchanges was very low.

Average monthly returns and corresponding t-values are calculated for all trading strategies (see Table 3). In Table 3, we denote formation periods T3, T6, T9, and T12 in columns, whereas holding periods of the corresponding length are denoted in rows. One can observe, that all 16 investment strategies provide positive returns (ranging between 0.122% and 0.5151%), and all of them are statistically significant except the –T6, T3 strategy. Although –T12, T3 strategy (the most profitable trading strategy) generates average monthly return of 0.5151%, which slightly exceeds the return of –T3, T3 strategy (0.4962%), the latter strategy is chosen for further analysis. This is done in compliance with the purpose of this research paper to analyze the pure short run momentum effect, thus –T3, T3 strategy is preferred to –T12, T3 strategy, which lies in fact on the line between short run and medium term. In addition, investment strategy of 3 formation months provides 36 additional observations if compared with the 12 month formation strategy, which allows drawing more statistically reliable conclusions.

In order to be able to state any meaningful conclusions about the size of the short run momentum effect in Baltic States, it is necessary to compare them with the findings of other authors obtained from different capital markets. In this paragraph a brief comparison with the findings of Jegadeesh, and Titman (1993) will be drawn. Both research papers document –T12, T3 (investment strategy of 12 formation months, and 3 holding months) to be the most profitable investment strategy, however the momentum returns for USA stock market are more than twice as large in comparison to the Baltic stock market (1.31% compared to 0.5151%). Furthermore, it can be also observed that in general all trading strategies in USA stock market generate higher momentum returns than corresponding trading strategies in Baltic stock market. Such findings can be attributed to the differences in sizes (measured in the number of actors trading) of the USA and Baltic stock markets. As the size of the market increases, a greater number of arbitrageurs gain access to the market, thus exploiting the existing inefficiencies (which are created by the greater number of trend seekers present), and thus earning higher momentum returns, than in the smaller Baltic stock market. Moreover,

further analysis reveals an important fact that the abnormal returns tend to increase as the time passes by (to be covered in more detail in the following sections), thus it can be assumed that in the future momentum returns might reach the level of those observed in USA stock market. To sum up, the findings for the Baltic stock markets support the findings of the Jegadeesh, and Titman (1993), and the conclusion about the existence of the short run momentum effect in Baltic stock markets can be drawn. In the next sections the possible sources of the momentum returns will be identified.

Average monthly returns for all strategies (t-values), (findings by Jegadeesh, Titman, 1993)				
-\+	**T3**	**T6**	**T9**	**T12**
T3	0.0032 (1.10)	0.0058 (2.29)	0.0061 (2.69)	0.0069 (3.53)
T6	0.0084 (2.44)	0.0095 (3.07)	0.0102 (3.76)	0.0086 (3.36)
T9	0.0109 (3.03)	0.0121 (3.78)	0.0105 (3.47)	0.0082 (2.89)
T12	0.0131 (3.74)	0.0114 (3.40)	0.0093 (2.95)	0.0068 (2.25)

Table 4. source: Jegadeesh, Titman, 1993.

4.3.Sources of momentum profits: one factor model evidence

4.3.1. Betas of relative strength portfolios

In order to clarify if abnormal returns occur due to the fact of picking stocks with high systematic risk, average portfolio betas for all trading strategies are calculated. Positive portfolio beta would indicate a tendency to include high risk stocks in the portfolios, whereas negative portfolio beta would neglect it. Betas for individual stocks are assumed to be constant over time (which gives a total of 4 different portfolio betas), and they are calculated by dividing the covariance between an individual stock return and the market return by the market return variance. For the calculation of individual stocks betas we use stocks' and market indices' returns for the period beginning on 1 January 2000 and ending on 27 December 2006.

Average portfolio beta for all trading strategies (t-values)				
-\+	**T3**	**T6**	**T9**	**T12**
T3	-0.00886 (-3.01188)	-0.00886 (-3.01188)	-0.00886 (-3.01188)	-0.00886 (-3.01188)
T6	-0.00552 (-2.07685)	-0.00552 (-2.07685)	-0.00552 (-2.07685)	-0.00552 (-2.07685)
T9	-0.00073 (-0.29363)	-0.00073 (-0.29363)	-0.00073 (-0.29363)	-0.00073 (-0.29363)

T12	-0.00803 (-3.19046)	-0.00803 (-3.19046)	-0.00803 (-3.19046)	-0.00803 (-3.19046)

Table 5. source: self composed.

Results prove that the abnormal returns do not come from the tendency of picking high risk stocks, as the betas for all investment strategies are negative, and all findings are statistically significant except for the –T9 trading strategies (see Table 5). These findings support Jegadeesh, and Titman (1993), who found the average beta for the representative trading strategy –T6, T6 (6 formation, and 6 holding months) to be equal to -0.08. To conclude, picking up highly volatile stocks does not seem to be an important source of momentum in the Baltic stock market.

4.3.2. Serial covariance of 3 month returns

According to the one factor market model, the second part of the right hand side in the formula (3) stands for the serial covariance of a particular trading strategy, and if the sources of momentum profits arise from the first or second term on the right hand side of the formula, then it would signal higher risk bearing and not stock market inefficiency. In order to test it, serial covariance of 3 month market index returns has been calculated. The result yields serial covariance equal to 0.0003724. Although the finding does not seem to be statistically significant (which can be explained by a rather small sample size of 67 observations) it is nevertheless positive, and allows a conclusion that a part of momentum profits comes as a compensation for higher risk bearing. This finding contradicts Jegadeesh, and Titman (1993), who find that the serial covariance for 6 months return investment strategy is negative.

4.3.3. Serial covariance of model residuals

According to Jegadeesh and Titman (1993), besides the two sources related to the compensation for bearing higher risk, the superior performance of momentum strategies can occur due to the serial covariance of the idiosyncratic component of security returns (serial covariance of one factor model residuals). In our case estimated average serial covariance of model residuals of the representative trading strategy is slightly negative – mean value is equal to -0.000414. However, significance of the estimate is rather low (t-value equal to -0.3010) which is most likely due to relatively small number of observed companies (67 in all the Baltic markets) from which returns covariance of residuals was calculated. Still, performing a t-test on alternative hypotheses that serial covariance is negative, equal to 0, and positive shows that hypothesis that covariance is negative can not be rejected with a smallest significance level (38%) if compared to the other hypotheses. Negative serial covariance

suggests that investors overreact to the firms' specific information and that overreaction is corrected in the short run. Looking back at the equation (3) also allows us to conclude that negative correlation on average decreases momentum profits – correlation of the idiosyncratic component of the returns is not very likely to be the source of the profits.

4.4. Sources of the momentum profits: two factor model (lead lag effect) evidence

This section in addition to the one factor model will examine another possible source of momentum profits - a lead lag effect in stock prices. As it is argued in the methodology part, the lead lag effect relationship, using our representative 3 month formation and 3 month holding momentum strategy, can be analyzed via the following regression:

$$r_{pt,3} = \alpha_i + \theta r_{mt,-3}^{\ 2} + u_{it}\,. \qquad (6)$$

If abnormal short run momentum profits occur due to the lead lag effect (relative strength portfolio reacts to changes in the factor mimicking portfolio with a lag), then the coefficient next to the squared stock market return must be positive. Otherwise lead lag relationship is not present. Investment strategy –T3, T3 is chosen to investigate the presence of the lead lag effect, where $r_{pt,3}$ stands for average return for the investment strategy, which is formed and held for 3 months, and $r_{mt,-3}^{\ 2}$ stands for the average demeaned squared market return for 3 months, t-3 to t-1. After running a regression a coefficient of -5.81352 (t-value of -2.04893) is obtained. Negative statistically significant coefficient next to the lagged squared market return implies that the lead lag effect does not stand as an important source of the momentum profits. This finding again supports Jegadeesh, and Titman (1993) results.

4.5. Momentum profits development over time

Besides analytical tests used by Jegadeesh and Titman to evaluate link between market efficiency and momentum profits, we also investigate profits development over time. To do so, the profits from different momentum strategies are regressed on time.

Coefficients of the regression (t-values)				
-/+	**T3**	**T6**	**T9**	**T12**
T3	0.0002722 (5.82)	0.0004672 (8.53)	0.0005754 (7.87)	0.0004947 (5.12)
T6	0.0003099 (9.12)	0.0004948 (9.30)	0.0006077 (8.13)	0.0005321 (6.45)

T9	0.0001425 (3.89)	0.0001471 (4.70)	0.0002658 (3.91)	0.0003207 (4.35)
T12	0.000109 (2.55)	0.0001129 (2.00)	0.0000435 (0.68)	0.0001871 (2.28)

Table 6. source: self composed.

As it can be seen from the Table 6 above, in all the regressions coefficient of time is positive which implies that momentum profits are growing over time. However, since Baltic stock markets in recent years were characterized by exceptionally high growth which increased over time (i.e. growth correlates with time), the omitted variable bias is possible to exist. As a result, to obtain more reliable results we repeat the regressions of momentum profits and control for the growth of the market (as a proxy of market growth we use OMX Baltic Benchmark General Index).

Coefficients of the regression, controlling for market growth (t-values)				
-\+	**T3**	**T6**	**T9**	**T12**
T3	0.0005971 (4.31)	0.000658 (4.31)	0.0010006 (5.41)	0.0010011 (4.62)
T6	0.0002387 (2.38)	0.0007245 (4.93)	0.0009666 (5.27)	0.000732 (3.95)
T9	-0.0001228 (-1.14)	0.0005385 (4.12)	0.0003607 (2.51)	0.0004447 (2.78)
T12	-0.0000747 (-0.61)	0.0000216 (0.16)	0.0000899 (0.63)	0.0006351 (3.33)

Table 7. source: self composed.

As it can be seen from Table 7, controlling for growth changes coefficients on time. Although in several regressions coefficient becomes negative (-T9, T3, and –T12, T3), in most cases it still remains positive and significant.

As argued by Kvedaras and Basdevant, over time efficiency of Baltic stock markets was increasing and approaching weak form level (2002, 17). Thus results of our regressions on time implies that though markets were getting more efficient, profits were not decreasing but growing bigger – it suggests that momentum effect is not affected by market inefficiency related factors. Such finding is in line with the identification that idiosyncratic risk (serial covariance of model residuals) is not an important source of momentum profits.

In general, the analysis of the momentum effect sources suggests, that phenomenon is rather created by factors in line with market efficiency theory. Market model residual study

indicated that company specific information (source of profits indicating market inefficiency) is not contributing to the positive momentum profits. In addition to that, profit development over time shows that effect decreases when market inefficiency declines (inefficiency affects the phenomenon negatively). Thus the factor creating the profits should be in line with efficient market theory, and as suggested by positive serial correlation of 6 moth market index returns, it is likely to be compensation for extensive market risk (due to selective picking of stocks) born by the trading strategy.

4.6. Portfolio liquidity

Finally, in order to capitalize on the short run momentum strategy and gain profits in reality, it must be possible to buy/sell stocks included into portfolio on the date of portfolio formation and realization – liquidity issue becomes important here. Therefore, average portfolio liquidity is calculated for the 3 month formation and holding trading strategy. Method used for calculating average liquidity is almost identical to the one used for calculating average returns, except the fact, that liquidity is analyzed in this case.

After adjusting for currency differences (http://www.bank.lv/eng/main/all/finfo/notkurpars/), average portfolio liquidity at the portfolio formation point in time equals 48,711 Latvian Lats (LVL), while average portfolio liquidity at the realization point in time stands for 60,097 LVL. In order to draw conclusions, whether such average portfolio liquidity level is satisfactory or not the results must be compared with the average market liquidity. Average market liquidity for the period 2000-2006 stands for 65,236 LVL. One might observe that average portfolio liquidity at the formation point in time equals slightly more than 74% of average market liquidity, whereas average portfolio liquidity at realization point in time counts for more than 92% of average market liquidity. In our opinion, such percentage is more than satisfactory, and it proves that investors could have successfully adapted momentum trading strategies in reality, and could have earned excess returns.

5. Conclusion and suggestions for further research

5.1.Conclusion

This paper is the first attempt to investigate short run momentum effect in the Baltic stock exchange while relating it to the efficiency of the selected capital markets. Analysis of the phenomenon employing techniques of Jegadeesh and Titman (1993) as well as our own methodology allowed us to answer the stated research questions.

Firstly, Ordinary Least Squares regression analysis of the past individual stocks returns showed that autoregressive process – a prerequisite for momentum effect to exist – is present in the Baltic capital markets – there is significant positive relationship between average weekly past and future returns at selected time *t*. The predictive power of past returns is strongest when at time *t* average weekly returns of past 12 months are used to explain average weekly returns of 9 future months (regression coefficient indicates that 10% of past returns' size is still present in the future returns). Predictive power of past returns is weaker in other strategies, however in all cases it remains statistically significant at 1% significance level.

Secondly, as far as the extent of the momentum effect is concerned, profitability of the momentum based trading strategies (which is used as a proxy for the size of the momentum effect) is positive and significant in all the combinations of past and future returns. Identically as found by Jegadeesh and Titman (1993), the most profitable strategy is the one which selects stocks according to their cumulative returns of past 12 months and holds the position for the upcoming 3 months. However, the profitability of all strategies is significantly smaller than found by Jegadeesh and Titman (1993) – on average Baltic momentum strategy yields monthly return equal to 0.52% as American one reaches monthly profitability of 1.31%. The possible explanation for such a discrepancy is the large difference in capitalization of Baltic and USA stock markets.

Analysis of the source of momentum strategies using representative trading strategy (3 months to 3 months) provides with some controversial results. It clearly identifies that positive profits is not the compensation for holding stocks with high betas – average momentum portfolio beta is negative.

However, analysis of the second source shows that serial covariance of equally weighted index returns is positive. Thus it is likely that momentum profits occur due to picking of the stocks with high betas when market growth expectation is high and with low beta then market is expected to go into recession – profits are likely to be compensation for risk.

The study of the last source shows that momentum profit is not a compensation for company specific information and risk – this inefficiency related source of the profit appeared to be insignificant due to slightly negative correlation of market model residuals. In addition to that, momentum effect is not created by lead-lag effect of the stocks (stocks reacting to the changes in market portfolio with a lag).

As far as the development of the effect over time is concerned, it seems to be increasing in the recent years. Regression coefficient indicates that when controlling for market growth, on average momentum profits increases by 0.2% each month.

Growth of the momentum profits when the inefficiency of Baltic stock markets was gradually increasing suggests that short run momentum effect does not occur due to market inefficiency. Such a conclusion is enforced by the profit source analysis, which indicated that the biggest contributor to the momentum profits is related to the market efficiency reasons.

As to the practical implementation of the momentum strategies, the largest obstacle in the Baltic stock markets – low liquidity of the stocks – is not affecting momentum trading strategies. Liquidity of the strategies is close to the average market liquidity.

5.2.Suggestions for further research

Despite extensive analysis of the short run phenomenon performed in this paper, some additional research in the field based on Baltic stocks data is still possible. Firstly, analyzing how effect changes when total market capitalization grows could bring further insight to the understanding of the phenomenon. It is possible, that the size of the effect is correlated with the size of the market (as suggested by comparison of this paper results with Jegadeesh and Titman (1993) findings from USA data), and thus when comparing momentum research done for different economies some special adjustment has to be made. Moreover, observing effect during event time (then firm specific information is presented to the wide public) and researching seasonal fluctuation in the momentum profits is possible. As the most sound theories explaining phenomenon argue that momentum effect is a fully created by psychological bias of the investors, investigation of market actions in psychologically sensitive periods of information issuance should allow understanding the specific origin of the effect. Finally, in future years, when more data about separate Baltic stock markets is available, analysis of the differences between Latvian, Lithuanian, and Estonian momentum profits would contribute to the understanding of how phenomenon behaves in different emerging markets environments.

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7. Appendixes

7.1.Appendix 1

Delisted companies across Baltic stock exchanges (2000-2006)

Number	Delisted company	Date	Stock exchange
1	EMV	08.02.2000	Tallinn SE
2	Ogres MR	17.04.2000	Riga SE
3	Leks Kindlustuse AS	01.07.2000	Tallinn SE
4	Reval Hotelligrupi AS	01.11.2000	Riga SE
5	Daugavpils MRS	12.19.2000	Riga SE
6	AS Eesti Ühispank	01.01.2001	Tallinn SE
7	AS Fakto	30.03.2001	Tallinn SE
8	AB "Akmenės cementas"	05.06.2001	Vilnius SE
9	JSC "Balta"	N/A	Riga SE
10	AB "Kauno tiltai"	03.12.2001	Vilnius SE
11	"Baltic Marine Fishing Company"	22.12.2001	Riga SE
12	Tallinna Külmhoone AS	23.02.2002	Tallinn SE
13	AS XXL.EE	23.02.2002	Tallinn SE
14	Kalnapilis	01.03.2002	Vilnius SE
15	Ragutis	17.06.2002	Vilnius SE
16	Sampo Pank	19.08.2002	Tallinn SE
17	JSC "Misas kūdra"	19.09.2002	Riga SE
18	AB "Šiaulių stumbras"	31.12.2002	Vilnius SE
19	JSC "Solo Rīga"	08.01.2003	Riga SE
20	"Liepājas eļļas ekstrakcijas rūpnīca"	10.01.2003	Riga SE
21	AB "Aliejus"	24.01.2003	Vilnius SE
22	JSC "Naruta"	19.12.2003	Riga SE
23	AB "Naujieji Verkiai"	31.12.2003	Vilnius SE
24	JSC "Kaija"	11.05.2004	Riga SE
25	JSC “Paraugtipogrāfija”	19.05.2004	Riga SE
26	AB "Eglės sanatorija"	01.07.2004	Vilnius SE
27	AB “Panevėžio pienas”	04.10.2004	Vilnius SE
28	JSC “Preiļu siers”	20.01.2006	Riga SE
29	“Rīgas ostas elevators”	01.04.2006	Riga SE
30	“OT Grupa”	01.04.2006	Riga SE
31	“Tukuma GPS"	01.04.2006	Riga SE
32	JSC “Rīgas Transporta flote”	19.04.2006	Riga SE
33	Ekranas	01.06.2006	Vilnius SE
34	Drobė	N/A	Vilnius SE
35	JSC “Valters un Rapa”	20.07.2006	Riga SE
36	JSC “Viesnīca Latvija”	23.08.2006	Riga SE
37	JSC “Sporta pils”	25.11.2006	Riga SE