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PERFORMANCE OF SMART BETA STRATEGIES IN BALTIC STOCK MARKET

Bachelor´s thesis

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I declare that I have compiled the paper independently and all works, important standpoints and data by other authors has been properly referenced and the same paper has not been previously presented for grading.

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ABSTRACT

Smart Beta strategies that is used in a stock portfolio construction process by using other than market-cap weighting methodologies gained popularity over the last years. Mostly relying of the data from developed markets, previous studies find that Smart Beta strategies provide superior risk-adjusted returns compared to traditional market-cap indexation. The aim of this study is to tests Smart Beta strategies in the context of the Estonian, Latvian, and Lithuanian stock markets over the 2008-2018. Factors targeted during the research are size, value, leverage, liquidity, and for each of them a single-factor index is created. To give exposure to style factors, financial metrics as price to earnings, price to book, enterprise value to EBITDA, current ratio and revenue are used. In addition, fundamental-weighting is applied as an alternative to traditional cap-weighted weighting scheme. The results show that "low risk", "liquidity" and "value" strategies provide higher risk-adjusted returns while "size" and "high risk" strategies underperform. On average, indices constructed by using Smart Beta strategies are overperforming the benchmark by 1.3%.

Key words: Smart Beta, factor-investing, alternative weighting, Baltic stock market, cyclicity, performance evaluation

INTRODUCTION

Market capitalization is a widely used method to allocate weight to stocks in the index where the firm with the largest market value receives the highest weight. Despite of its´ simplicity and realistic reflection of market behaviour, it has a disadvantage of giving too much exposure to large firms. This might become a problem in the period when large companies are in a decline of their economic activity. It already happened during 2000-2002 stock market crash when large companies incurred huge losses (Philips *et al*, 2015). Investors have come up with Smart Beta that solves this problem by allocating weight to stocks by any other method than market capitalization. Smart Beta offers portfolio diversification, lower risk and enhanced returns through systematic portfolio building process. It allows constructing indices according to investors´ preferences by using factor-investing and alternative-weighting. Factor-investing assumes giving exposure to certain factors, most popular of which are size, value, high quality, momentum and low volatility. Alternative-weighting methods include any weighting schemes that do not weight securities by their market value, the most common of which is fundamental-weighting (Hohman, Patel, Roman 2017). As Smart Beta combines low-cost index-tracking and the potential to outperform the market, it is considered a golden middle way of passive and active investing. It has become more recognized in last years: according to Morningstar, its assets under management have grown by 257% from 2012 to 2017 (FTSE Russell 2018). Its popularity is expected to grow because of the expected positive economic environment.

The reason for choosing this topic is that investors will always seek for alternative portfolio-building options to outperform the market. Smart Beta offers index-construction methods that carry a potential of excess returns which will always remain the main priority of investors and is an actual topic to discuss about. The aim of this research is to see whether Smart Beta strategies have effect on Baltic stocks and to determine how the chosen methods perform and drive the returns of constructed indices during years 2008-2018. The assumption of the research is that Smart Beta has effects on Baltic stocks and that it can be considered as a good quality tool to drive stock returns. Baltic states share similar history, economic policies and developments (Poissonnier 2017). Baltic region can be characterized as a low-risk, low-liquidity, low-debt and politically

stable setting with a positive outlook. It was chosen as a research area because it is interesting to see how Smart Beta strategies perform in this relatively stable market environment. The research period includes post-economic crisis recovery that influenced global economy. During 2008-2018 worldwide political and economic environment has seen many cycles and it is possible to evaluate how the chosen strategies influence portfolio returns at different times. The changing environment is a good option for assessing strategies as it allows to track their movement over time. As stock market performance tends to fluctuate at different times, it is useful to note the procyclical nature of the factors that drive stock returns in order to give a better explanation to achieved outcomes.

The research methods used in the research were mainly quantitative. The quarterly fundamental data of NASDAQ Baltic stocks was gathered for years 2008-2018 by using Thomson Reuters Eikon database. The initial dataset included 80 firms but missing data influenced the further data preparation processes and 29 stocks were left out of the stock universe. Other 51 stocks had the data available to conduct the research on desired dates and financial fundamentals. In the literature review part, the evolution and characteristics of factor-investing and Smart Beta was described.

The obtained results present and evaluate the performance of chosen strategies. The main assessment is done on whether and by what percentual amount the strategies under- or outperform the market-cap weighted benchmark index. Also, the details about stocks´ volatility and statistical significance are provided. In the research, "value" strategies, leaded by the "price to book" index, have shown the best performance by exhibiting highest excess returns and lowest volatility. Furthermore, the "value" strategies are the only ones that are proved statistically significant. On contrary, the "size" strategy demonstrated the worst performance by holding least excess returns and highest volatility compared to benchmark. Given results can be used to evaluate the strategies´ performance, characteristics and procyclical nature. However, the reader should keep in mind that results based on past performance do not guarantee successful outcome in the future.

The paper starts with a chapter about evolution of factor-investing and discusses the first findings and further development on the subject. It also explains the main factor exposures and introduces the reader with Smart Beta´s strategies. Finally, it describes several factor-choosing methods, different weighting schemes, importance of rebalancing and evaluation methods. The second chapter explains the data selection and cleaning processes and is followed by methodology and market environment analysis. Results are explained in the third chapter which also includes statistical significance and different scenarios´ testing. Also, the limitations of the research and

recommendations for further research are provided. The final chapter sums up the paper with a conclusion and main findings.

1. LITERATURE REVIEW

1.1. Evolution of factor investing

The basis of the academic research in this category is the Capital Asset Pricing Model (CAPM), which was the earliest mathematical explanation of the risk and return relationship. The model was derived from Markowitz´ Portfolio Theory and it implies that the return on assets should equal the gain on a risk-free bond plus a premium proportional to the amount of systematic risk (unavoidable market risk) the stock holds (Treynor 1962; Sharpe 1964; Lintner 1965). In simple words, it assumed that assets´ returns can mainly be explained by the market risk. As CAPM only accounted for only one variable - systematic risk (beta – β) - it is called a single-factor model. Extension for CAPM was Intertemporal Capital Asset Pricing Model (ICAPM), which describes security´s movement by its relationship to aggregate consumption (Merton 1973). However, even though CAPM is based on simple assumptions and is easy to use, it holds unrealistic ideas about perfect financial markets, investors´ unlimited borrowing and lending with constant risk-free rate. Because of these drawbacks and new empirical evidence about other existing factors, the new alternative called Arbitrage Pricing Theory (APT) was introduced. This revolutionary extension to single-factor model explained return on a single asset as a linear function of multiple independent macroeconomic and security-specific factors (market indices, inflation, changes in interest rates, etc) as sources of systematic risk. (Ross 1976). By expanding the CAPM and APT in 1993, Fama and French came up with a model which introduced two additional factors – "size" and "value". Their extended 3-factor model considered the historical outperformance of small-cap stocks over large-cap stocks ("size" factor), and outperformance of value stocks over growth stocks ("value" factor). In 2013 they suggested an advanced 5-factor model including „profitability" and „investment" factors. "Profitability" factor assumed that profitable firms provide higher returns compared to less profitable ones, while the "investment" factor promised

excess returns from firms that invest conservatively, not aggressively. As it can be inferred from the previously discussed models, factors are variables that drive and explain equity returns (FTSE Russell 2015). Nowadays, holding a larger and constantly increasing historical dataset, pricing models could be extended to hundreds of factors that would determine assets´ sensitivity towards certain variables and explain the behaviour of the portfolio and returns on investments.

Table 1. The origins of factor investing.

Author	Invention	Discovery	Year
Sharpe, Lintner, Mossin	CAPM	Single-factor model. Distinction between alpha (excess return compared with a benchmark) and beta (market risk)	1964
Haugen, Heinz	Low-volatility	Low-volatility equities offer higher risk-adjusted returns	1972
Banz	Size - factor	Stocks with small market capitalization outperform stocks with large capitalization	1981
Basu	Value - factor	Equities with low P/E ratio get higher returns than the ones with high P/E ratio	1981
Fama, French	3-Factor model	Size and value factors drive excess returns	1993
Carhart	4-Factor model	Momentum – factor premia	1997
Fama, French	5-Factor model	Profitability and investment factors drive excess returns	2013

Source: Invesco: https://www.invesco.com/static/us/institutions/contentdetail?contentId=befa3c9d93736610VgnVCM1000006e36b50aRCRD

Given historical developments of pricing models, it can be noted that to achieve excess returns and to enhance the control over risk exposures, factors have been employed in portfolio-building for many years. According to BlackRock (Ang 2017), Invesco, Fidelity Investments, MSCI, five most well-known and commonly used style factors as main exposures in a portfolio are:

- Size. The idea behind „size"- factor exposure is that superior return exists when investing in smaller companies. Historically, small stocks tend to outperform larger ones because such firms are usually riskier: they are less investigated and have a bigger probability of going bankrupt. Therefore, investors should be compensated for taking on that extra risk (Banz, 1981, Fama and French 1993).
- Value. Value-investing implies that stocks with low prices relative to their fundamental price (value firms) outperform more expensive stocks (growth firms) over time. According to

Zhang, value companies are more sensitive to unfavourable economic environments (2005). Another theory is that value firms have larger financial leverage and their future earnings are more uncertain compared to growth firms (Chen and Zhang 1998). Given this, excess returns are captured as a compensation for accepting higher default risk, leverage and cyclicity, and smaller profitability of such companies (Cochrane 1991, 1996). Fama and French research also showed that value investing can generate excess returns over time, as their empirical results indicated that stocks with high book-to-price ratios (value stocks) outperformed stocks with lower ratios (growth stocks) (1993).

- Momentum. Momentum investing assumes that if stocks performed well in the medium term, they will continue to do so. In this case, strategy relies on the temporary duration of an ongoing (upward) market trend, and excess returns are expected when buying stocks with better past performance and selling the ones with poor performance (Jegadeesh and Titman, 1993; Carhart 1997).
- Quality. Exposure to „quality"- factor records excess returns of stocks of companies with good "quality" metrics. Generally, such metrics include holding strong balance sheets, showing stable cash flows, dividend and earnings growth and quality, low accruals, making superior profits, having low debt (Sloan 1996), and thus, outperforming over time (Asness, Frazzini, Pedersen, 2013).
- Low volatility. In this approach, premium returns are captured in stocks that have lower volatility, beta, and/or idiosyncratic risk. It may seem to be on the contrary to CAPM model, which states that higher volatility is associated with higher returns. However, research has shown that low-volatility portfolios result in higher risk-adjusted returns, meaning that they outperform the broader market over time (Haugen and Heins 1972; Frazzini and Pedersen 2014)). Secondly, because high returns are favoured, there is behavioural excess demand for higher risk stocks, low beta stocks are then becoming unattractive and should be compensated (Baker and Haugen 1991; Boyer, Mitton and Vorkink 2009). Furthermore, it has been established that this approach has performed best during market decline when volatility is high. It can be explained by the fact that stocks with low risk perform better when market is down and investor uncertainty is high.

1.2. „Smart Beta“

Traditional portfolio construction assumes minimizing risk through diversification across different industries, geographical areas and asset classes (commodities, real estate, emerging markets, etc). In factor investing, however, lower risk is gained by diversifying across factors (FTSE Russell 2015). In this case, portfolio construction requires factor-exposure decisions to reach specific risk-and-return goals (positive risk premium), and investors may think of factor exposures within „Smart Beta“ strategies (also known as “strategic beta”; „alternative indexing“; „alternative beta“). In recent years „Smart Beta“ indices have become a popular and relatively inexpensive tool that ensures diversification and helps to capture excess returns on investments. These strategies aim at targeting previously discussed factors such as value and size (traditional style indexes) and low volatility, momentum and quality (factor indexes), which, used individually (single-factor models) or combined (multi-factor models), help to capture excess investment returns. A combination of indexes supports forming a diversified investment portfolio where chosen exposures move toward or away from desired or undesired risks (FTSE Russell 2016).

Even though there is yet no exact definition of „Smart Beta“, its´ main principles were originated already decades back in form of factor-based investing that has been applied in portfolio construction process since 1990´s. “Strategic Beta”´s main idea is to use any index-based strategy that chooses or weighs securities by using any other factor than their market capitalization (sum value of the price of all issued shares) (Research Affiliates 2017). Traditional market-cap method is still widely used as it is attractive and inexpensive to implement. However, as it weighs companies based on price and number of shares issued, it carries a risk of giving more exposure to overpriced, and less for underpriced stocks (FTSE Russell 2016). Also, it underestimates the promising potential of smaller firms and gives preference to those that have already experienced growth in the past (Zerilli 2018). It might become a problem at times when large firms are underperforming, as it happened in 2000 and ended with a stock market crash in 2002 (Vanguard 2005). Apart from that, Smart Beta strategies break the link between the price and portfolio weight, relying on alternative measures than price when selecting a weighting method. Like the passive investing, Smart Beta is a low-cost approach that offers lower risk through diversification and has a clear investment process. On the other hand, factor investing aims to outperform the market, which is essential for active management method. Thus, this strategy is considered as an intersection of passive and active investing, because it combines principles of both techniques and offers the potential of providing higher returns, lower risk, or a combination of both (FTSE Russell

2017). It also explains why Strategic Beta has gained popularity in last years: According to the Smart Beta global asset owner survey that was conducted in 2018 by FTSE Russell, its´ utilization has been in an upward growth trend for five years since 2014, led by the adoption of multi-factor and fundamental-weighting strategies. In anticipation of a positive market environment, worldwide known consulting firm PWC forecasts a further increase in the amount of investable assets and expects index- and, especially, factor-based strategies to become more recognized and employed by year 2020 (2014).

Each Smart Beta strategy differs from a market-cap-weighted index by targeting different objectives, seeking to outperform traditional cap-weighted indices on risk-adjusted basis (Amenc *et al*. 2014). For example, single- or multifactor strategies are considered by those who want to outperform the market and should therefore lead to different risk and return performance.

In several academic sources Smart Beta is classified differently. FTSE Russell divides Smart Beta in two methods of indexing:

- Alternatively-weighted indexation, which is used to set apart price of a security from its weighting; to minimize risk within the index or to increase diversification within a portfolio. It involves any method that is not market-cap weighted, such as equally-weighted, fundamentally-weighted, low-volatility, minimum variance and some other indexes.
- Factor (single- or multifactor) indexation, where the goal is to reach regulated exposure to target specific factor(s) by re-weighting an underlying index towards the target factor(s). Target factors may include such stock characteristics as value, size, momentum, low volatility, quality, illiquidity and yield (FTSE Russell 2017). Single-factor strategies give exposure to them as to individual potential drivers of return, while multifactor strategies assume combining several factors into one fund to gain value from each.

Morningstar, however, has developed a further categorization of Smart Beta strategies:

- Risk-oriented strategies, where the main idea is to reduce index´s volatility. After the bear market in 2000-2002 and the financial crisis in 2008-2009, investors want to secure themselves against the risks that asset investing holds (Philips *et al*, 2015). To minimize the risks, they apply Low/High beta and minimum variance strategies.
- Return-oriented strategies include Multi-factor, Quality, Momentum and Fundamental-weighting. As the name indicates, the main preferred outcome of using these methods is higher return;

- Other strategies, where investors combine previous practices and stay both return-and risk-oriented. In this case, equal-weighting and multi-asset strategies might be used.

MSCI, BlackRock, FTSE Russell, together with other financial institutions and investment research firms provide several subdivisions of Smart Beta weighting and factor strategies. According to ETF Guide, Smart Beta also includes a Capped- or GDP-weighted strategy where exposures are made to concrete regional markets based on real-time indicator of country´s economic health. However, majority of common practices of these users are overlapping and the main idea remains the same: in a rules-based way, they all seek to improve risk-adjusted performance relative to the benchmark. A more descriptive information about Smart Beta methods and amount of risk and returns that they provide will be discussed further in chapter 1.3.

1.3. Implementing Smart Beta strategies

1.3.1. Choosing factors

As mentioned before, "Smart beta" investment strategy assumes building diversified portfolios where stocks are selected and weighted using any other scheme than traditional market capitalization. It means that investments made using Smart Beta strategies go beyond the market portfolio and investors construct portfolios based on their preferences or expectations on future risk premiums. (Nielson, Nielsen, Barnes 2016). Methodically choosing, weighting, and rebalancing portfolios to prioritize securities with attributes that provide enhanced risk-adjusted returns - are essential processes for Smart Beta.

Investor may think of his personal preferred investing outcomes or objectives when choosing the strategy of factor allocation as there is no one and only perfect strategy for a common use. Specific performance or level of risk could be targeted according to personal preferences - some seek to reduce risks while others try to generate yield and enhance returns. Striving for holding smaller risk could result in choosing a minimum-volatility strategy where investments are made in stocks, prices of which do not fluctuate much (Haugen, Heins 1972). Another possibility is to construct a risk-weighted index where investor should weigh index´s constituents by the inverse of their historical volatility. In this case, stocks with lowest historical volatility get bigger weight in the index. (MSCI 2013). Both methods result in a reduced risk while the outcome is similar or even

superior to market performance. For those seeking for enhanced returns, strategies such as fundamental-weighting or multifactor would be appropriate.

The main idea of factor-investing is that everything that predicts or explains returns might theoretically be called a "factor". Hence, the primary decision for the investor to make is to determine relevant factor or factors to use (Huij 2018). As some strategies of Smart Beta are based on factor investing, it targets factor premiums in a systematic way. Exposure to "size" factor can be easily gained by ranking market capitalization of stocks and including the small-cap stocks to the portfolio (Zerilli 2018). Several financial metrics can be used to define value within equities, and performance may depend on which of them is used. Such fundamental metrics as earnings, dividends, sales, standard deviation of returns, book-to-price or other financial ratios are utilized as factors in Smart Beta strategies. (FTSE Russell 2016, 3-4). Return on equity (ROE), is considered a good indicator of quality as stocks with strong profitability will eventually outperform the market. Hence, ROE is a measurement that is commonly used in Smart Beta strategies when giving exposure to "quality" factor. To target "low-volatility" factor, standard deviation of returns (e.g. weekly or monthly price returns) and beta could be used (Grassi, Lastra, Romahi 2012). They are both used to evaluate stocks´ return dispersion or overall correlation to the entire market and, therefore, portfolios with a lower standard deviation and beta indicate smaller volatility of returns.

When relevant factor(s) are chosen, corresponding "smart" single- or multifactor index is created.

FACTOR RETURNS: EXAMINING BEST PRACTICES FOR SMART BETA EXPOSURE

** Market data thru 08/31/2017, cumulative returns use a start date of 12/29/2006, all returns exclude dividends**

2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017*
Value	Momen-tum	Low Vol	Value	Growth	Low Vol	Value	Value	Low Vol	Low Vol	Dividend	Growth
17.41	17.17	-23.61	49.26	26.35	10.87	22.98	45.53	14.48	1.61	26.82	17.42
Low Vol	Quality	Buyback	Growth	Momen-tum	Buyback	Momen-tum	Buyback	Quality	Growth	Value	Momen-tum
16.49	16.77	-34.27	48.43	26.26	9.07	17.16	44.56	14.06	1.48	17.05	15.43
Equal Weight	Growth	Bench-mark	Equal Weight	Value	Dividend	Equal Weight	Growth	Dividend	Momen-tum	Equal Weight	Bench-mark
14.12	5.80	-38.28	42.19	20.89	4.40	15.21	42.65	13.92	0.76	13.05	10.72
Bench-mark	Bench-mark	Growth	Buyback	Quality	Quality	Growth	Equal Weight	Growth	Quality	Quality	Quality
13.80	3.24	-39.23	29.36	19.79	4.39	13.97	33.63	13.12	-0.64	12.36	8.35
Dividend	Equal Weight	Equal Weight	Momen-tum	Equal Weight	Momen-tum	Bench-mark	Momen-tum	Equal Weight	Bench-mark	Buyback	Equal Weight
9.98	-0.34	-41.08	27.19	19.68	1.36	13.47	31.27	12.35	-0.81	11.00	7.59
Momen-tum	Low Vol	Dividend	Bench-mark	Buyback	Growth	Buyback	Quality	Momen-tum	Dividend	Bench-mark	Low Vol
7.58	-2.16	-41.49	23.49	17.52	-0.02	12.33	29.84	12.03	-1.11	9.64	9.48
Growth	Buyback	Momen-tum	Low Vol	Dividend	Bench-mark	Quality	Bench-mark	Buyback	Equal Weight	Low Vol	Buyback
6.55	-2.48	-46.35	15.52	15.82	-0.20	12.05	29.69	11.54	-4.26	7.80	7.02
Quality	Value	Quality	Quality	Bench-mark	Equal Weight	Low Vol	Dividend	Bench-mark	Buyback	Growth	Value
4.58	-6.71	-46.41	12.20	12.84	-2.18	6.75	25.93	11.29	-5.39	3.56	3.49
Buyback	Dividend	Value	Dividend	Low Vol	Value	Dividend	Low Vol	Value	Value	Momen-tum	Dividend
n/a	-18.94	-49.76	-1.77	9.79	-2.73	1.73	19.80	10.43	-10.48	1.52	-1.24

Figure 1. Differences in returns using exposures to different factors in years 2006-2017
Source: (Nasdaq 2018) - https://indexes.nasdaqomx.com/docs/NQVMVUS%20Research.pdf

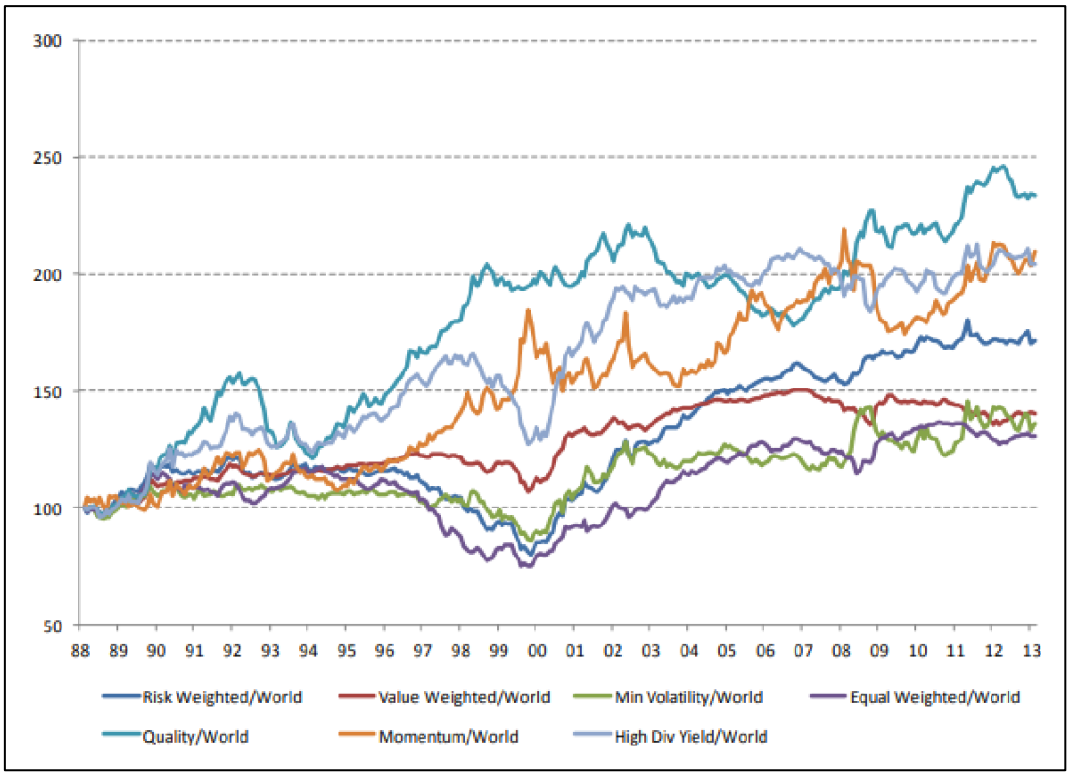

Figure 2. All systematic factors are cyclical (Cumulative relative returns, June 1988 to June 2013). Source: (MSCI 2013) - https://www.msci.com/documents/1296102/1336482/Foundations_of_Factor_Investing.pdf/004e02ad-6f98-4730-90e0-ea14515ff3dc

These illustrations show that factor-based investing tend to have cyclical nature, which means that the factor performances vary at different times of the economic cycle. Value, for instance, as a pro-cyclical factor, outperforms in times of economic growth, while quality has been proven to act as a countercyclical factor (FTSE Russell 2016). Small-caps underperformed relatively to the benchmark during 1990´s tech bubble and 2007-2008´ financial crisis. Drops in low-volatility stock performance happened post crisis, when, after the bear market, period of increasing stock prices followed (Hohman, Patel, Roman 2017). To enhance diversification and gain some stability, factors´ performance patterns should be taken into account. In this case, choosing a factor mix instead of single-factor strategy may have crucial effects – as multifactor approach offers an advantage of combining factors that are minimally correlated and that tend to succeed in different periods, it solves the problem of cyclicality (MSCI 2013/2018).

According to BlackRock, multifactor investing has grown with a rate of 1742% in assets from year 2009 to 2018. The easiest way to implement multifactor strategy is owning the strongest stocks for each factor, which means choosing and combining relevant single factors and assigning stock

weights to all of them ("top down" approach"). A bit more complex but promising method is an integrated ("bottom up") approach, where the main intention is screening for stocks with exposure to multiple factors (FTSE Russell 2017, BlackRock 2018). It assumes searching for firms that have more than one performance drivers: a strategy might be targeting small companies with a dividend growth trend, low debt and strong financial statements. This method is more time-consuming as it has more selective process – potential stocks need to be carefully assessed and analysed to be included into portfolio. In this case, however, it is hard to determine which factor exposure drives returns. By diversifying away unrewarded risks and giving exposures to beneficial factors, multifactor approach eliminates unwanted factor exposures and their concentration.

1.3.2. Alternative weighting

The main principle of Smart Beta assumes index weighting methods that are not traditional capitalization-weighted. As discussed earlier, the stocks are selected with a purpose of enhancing exposure to the desired factor(s) and, as a result, they form the investment portfolio. Therefore, next important decision to make is the weighting method and the amount of weight that should be allocated to each factor. While performance results can be significantly affected by variations in weighting and rebalancing techniques, it should be ensured that the portfolio is well-diversified (smart-weighted), because diversified portfolios drive premium returns and eliminate unrewarded risks. There are several weighting schemes for obtaining exposure to multiple equity factors in a portfolio that will be further discussed.

1.3.2.1. Outcome or Return-oriented weighting

These weighting schemes seek for excess returns relatively to the benchmark using diversification. These are dividend-weighted, value-weighted, fundamentally-weighted, earnings-weighted, equal-weighted, multi-factor and some other methods. Most commonly used approaches will be described below.

- Fundamental-weighting strategy. As the name suggests, fundamental weighting strategy uses company´s fundamental size metrics – cash flow, dividends, book value, revenue – to weigh stocks. Users of this approach trust financial-valuation measures as indicators of financial health and intrinsic value indicators. In year 2005, Rob Arnott, Philip Moore and Jason Hsu in their research found out that fundamentally weighted indices outperformed the standard benchmark of cap-weighted index S&P500 by about 1.97% in a time frame of 1962-2004.

This method is also a good example of how Smart Beta is combining principles of both passive and active investment strategies: „A systematic, fully transparent approach that preserves all the benefits of traditional passive investing: broadly diversified, low cost and high investment capacity“ (Research Affiliates). FTSE RAFI US 1000 Index is based on the largest 1,000 fundamentally-ranked companies, where book value, sales, dividends and cash flow were used as factors to carry out the fundamental weighting (FTSE Russell 2018). At first, four different index weights are calculated for each fundamental value (based on a 5-year average of historical fundamentals). Then, each company's weight is calculated relatively to the other companies. Lastly, the weights each company would have in the four fundamental indices are combined equiproportionally. According to FTSE Russell, fundamental weights are specified as:

$$W_i = \left(\frac{Sales_i}{\sum_{i=1}^{n} Sales_i} + \frac{Book\ Value_i}{\sum_{i=1}^{n} Book\ Value_i} + \frac{Cash\ Flow_i}{\sum_{i=1}^{n} Cash\ Flow_i} + \frac{Dividends_i}{\sum_{i=1}^{n} Dividends_i}\right) \times \frac{1}{4} \quad (1)$$

where
W_i – weight of the stock *i*
$Sales_i$, Book $value_i$, Cash $Flow_i$, $Dividends_i$ are the 5 – year averages for each metric for stock *i*.

- Equal-weighting strategy. Equal-weighting indexation assumes that all the stocks comprise the same amount of weight in a portfolio (FTSE Russell 2017). For example, in S&P500 Equal Weight Index, each of 500 stocks is assigned a weight of 0.2%, regardless of their relative size (market value). According to Stahn, Raab and Kula, the idea of this strategy is that higher exposure is assigned to smaller companies that in case of financial disruption are more affected by market fluctuations and, thus, own higher risk (2017). Hence, theoretically they carry higher return potential compared to large firms. Utilizing equal-weighting gives exposure to the „size“ factor by assigning greater weight to small-cap firms and should produce higher portfolio returns. Equal weights are assigned as:

$$W_i = \frac{1}{N} \quad (2)$$

where
W_i - weight of the stock *i*
N – number of stocks in the index

1.3.2.2. Risk-oriented weighting

This approach aims at decreasing or increasing the risk level compared to benchmark. It includes such attribute as minimum-volatility weighting, low-beta weighting and risk-weighting strategies.

- Risk-weighting strategy. In risk-weighted indexation, weights are allocated based on evaluation of security´s returns´ variance in the past. In this case, securities with higher historical volatility are given lower exposure in the index and larger index weights are assigned to stocks with lower historical volatility. This results in about 20-30% less risk in the portfolio compared to cap-weighted indices (MSCI 2013).

In this matter, stocks are weighted by the inverse of their variance (FTSE Russell):

$$W_i = \frac{1/\sigma_i}{\sum_{i=i}^{n} 1/\sigma_i} \quad (3)$$

where
W*i* – weight of stock *i*
σ_i – volatility of the stock *i*

1.3.3. Rebalancing

As portfolio deviates away from initial asset allocation over time, next essential process in alternatively weighted indexing is rebalancing (Atwill 2014). The reason for rebalancing is that stocks´ price tend to fluctuate - attractive stocks´ prices go up and contrary happens to unattractive stocks. Because of that, they correspondingly receive bigger or smaller weight in the portfolio. However, if security´s weight grows, fundamentals may not reflect its real value. To avoid such falsity, rebalancing is used to bring back stocks´ weight to an original preferred asset allocation level that corresponds to its intrinsic value. Rebalancing is done quarterly, annually or whenever the allocation deviation from target has reached some concrete percentage (Invesco 2017). Rebalancing, eventually, results in restoring the diversification, presence of which is fundamental for Smart Beta.

1.4. Evaluating the performance Smart Beta strategies

Because market-cap weighting assumes that companies with high market value own the highest weight in the index, interest in market capitalization-weighted indexes has slowly declined since 2002, when large companies incurred huge equity losses (Vanguard 2015). After the stock market crash, popularity of alternative strategies has been growing as it eliminates the risk of overweighting large-cap stocks (Arnott, Hsu and Moore, 2005). Using any of Smart Beta methods, the goal is to gain excess returns but keep the risk level similar to the broad market index. Thus, it would be fair to compare the outcome of Strategic Beta strategies to same broad, market cap-weighted index (Russell 1000, S&P 500 Index, the Nasdaq Composite Index, etc). In this case, the core market index is applied as a suitable benchmark that is used to assess how well funds perform

in a particular asset class. The difference between the return of benchmark and investors´ portfolio is measured by tracking error.

There are also other moments of comparison and usually the benchmark selection depends on investment objectives. As previously discussed, investors who target factors that reduce risk, buy low-volatility funds. In addition to decreasing risk, another interest is in gaining risk-adjusted return that would compensate that level of risk. One possible way to evaluate the performance of such funds is to see if with smaller amount of risk investor still gets returns and exposures like market does. So, as with single-or multifactor strategies, volatility of funds can be compared to the one of broad market index. Another possibility is Sharpe ratio, that also measures risk-adjusted performance by evaluating the added value (premium return) per unit of volatility risk in the investment. If two assets are contrasted with the same benchmark, security with a higher Sharpe ratio yields a bigger return for the same amount of risk (Sharpe 1966, 1994).

Specific strategy types can follow corresponding style indices as benchmarks. For example, "value" securities may track value index (MSCI World Value Index, S&P 500 Value Index), "momentum" funds might follow growth index (Russell 3000 Growth Index, MSCI World Growth Index), while large-and mid-cap equities´ indices can serve as benchmarks for "size" ETFs (MSCI 2018). Then, it is simple to compare the constructed index´ performance with the benchmark by looking at the risk and return characteristics of both. Also, it is possible to use „backtesting" method which assumes testing strategies on a historical stock performance data. This kind of simulation can be done by giving exposure to certain factors and applying them to the stock portfolio. The idea is that hypothetical strategies are used with the same dataset to find out the most valid and promising ones. It is useful to take a larger time period consisting of different economic conditions to see how the changes influence the performance of each strategy. Then, strategies are compared to the benchmark and it can be noticed whether the method will gain any profit. Backtesting allows to analyze the returns and risk and in case of positive and sound outcome the strategy can further be implemented. However, because this technique only relies on the historical information and the outperformance might had been by chance, it is not a guarantee for future performance.

2. DATA AND METHODOLOGY

2.1. Data collection and cleaning

The research was conducted using data of Baltic listed companies. In exact terms, the universe consisted of stocks that were listed on Nasdaq Baltic in September 2018. The data was obtained using Thomson Reuters Datastream. The dataset extends over the 10-year period from 31 December 2008 to 30 June 2018, resulting in 10 years or 39 quarters in total. The research period was chosen as it was available and long enough to make inferences and conclusions on the performance of Smart Beta strategies. It also includes several subperiods that might affect the strategies´ results differently. For example, the post-crisis recovery period (2008-2011) and further phases of changes and in the market environment. The obtained dataset contained such fundamental information as market capitalization, price to earnings ratio (P/E), enterprise value to EBITDA ratio (EV/EBITDA), price to book ratio (P/B), current ratio, total assets to total equity (TA/TE) and debt to total equity ratios (Debt/TE) – that were later used to construct the factor strategies and indices.

Initially, the data was collected for 80 companies that were listed on Estonian, Latvian and Lithuanian stock exchanges. Because of some missing fundamental quarterly data for the period of 2008-2018, 29 companies were left out of the universe. Missing values for the remaining 51 companies were imputed:

- For sporadic quarterly “Not available” values, the average of neighbouring data was used;
- For missing data at the beginning or end of the period, the nearest available data was used;
- For P/E ratio, missing values were calculated using available data on sales, profit margin, number of shares outstanding and price.
- For the EV, missing values were calculated based on the changes of market capitalization and total debt;
- For EBITDA, missing values were calculated based on the changes in average EBITDA in the sample.

After acquiring and modifying the data, stock fundamentals were separately listed on Excel worksheets in chronological order starting from the last quarter of 2008.

2.2. Stock portfolio construction

The intention was to construct indices consisting of 20 stocks by applying Smart Beta strategies that would provide higher return than the market-cap weighted benchmark. It means that for each strategy (size, low-volatility, etc) 20 stocks with strongest factor characteristics were chosen. The reason for selecting 20 stocks is that it is a suffient amount enough to test Smart Beta strategies on well-diversified portfolios that are able to explain market trends. With given data, fundamentals were allocated to following single-strategy proxies:

Size: As previously discussed, "size" factor assumes giving larger exposure to smaller firms with higher risk. To give exposure to size factor, revenues of the companies were used. On a separate Excel worksheet they were ranked from smallest to largest and the 20 firms with smallest figures were chosen into a fund sample. Starting from 31.12.2008, rebalancing was done every quarter - hence, the stocks with lowest revenues were selected every three months. Afterwards, reverse revenue of each stock was calculated by dividing „1" by the stocks´ revenue. As the strategy implies, small companies carry higher risk and thus promise superior return: therefore, stocks with lowest parameters were given the highest weights in the portfolio. To assign weight for a stock, its´ reverse revenue was divided by the sum of all reverse stocks´ revenues. Then, using the „VLOOKUP" - formula, market capitalizations were found for each stock for the ending of current (beginning) and next (ending) quarter. After that, stocks weights were multiplied by their current quarters´ market capitalizations to find the current value of stock in the portfolio. To find a current portfolio total value, individual beginning stock values were summed up. Each stocks´ individual ending value was found by multiplying beginning value by the change of market capitalization from the ending to beginning period. In order to calculate the ending value of the porftolio, each stocks´ individual ending values were summed up. The change of portfolio value from was calculated by dividing the ending portfolio value by the beginning portfolio value and subtracting „1" from the ending result to convert into percentual format. This change reflects how much portfolio has gained or lost during one quarter. In simple words, it shows „size" strategys´ quarterly return. A composite index was then created of 20 stocks each period and later compared to the

market-cap weighted benchmark. Comparisons were conducted in both visual (graph) and numerical form (table).

Value: For the value factor there were three ratios used: price to earnings (P/E), enterprise value to EBITDA (EV/EBITDA) and price to book (P/B). The idea behind value factor is selecting and assigning more weight to firms with smaller value ratios. These firms carry higher risk and uncertainty for the future that need to be compensated. Thus, the chosen ratios were ranked from smallest to largest. Top 20 companies with smallest ratios were chosen every quarter and afterwards, the ones with smallest ratios were given highest weight. Further processes were performed in the same way as with the „size" factor.

Liquidity: Liquidity-based investing assumes that less liquid stocks provide excess returns because they are easier and cheaper to trade. Current ratio was chosen as a liquidity factor because it reflects whether the firm is able to meet its short-term obligations. Higher current ratio indicates that company is in good condition to cover its current liabilities. Similarly to previous ratios, stocks were also ranked quarterly, from highest to lowest, and top 20 were chosen into portfolio. In this case no reverse of the ratio was needed as it is sufficient to select the most liquid companies. Hence, the companies with highest current ratio were assigned with highest weights.

Leverage: In the research high and low leverage were tested – hence, two different calculations were performed. Debt to total assets ratio was used as a high risk factor and for the low risk the ratio had to be reversed. The two calculations assumed choosing 20 top and 20 bottom stocks, respectively. Two indices were constructed using the same method as with previous factors.

As described, single-factor strategies in this research were combined with weighting stocks based on their financial valuation metrics such as revenue, current ratio, price to earnings ratio and others. Fundamental-weighting was performed to avoid market mis-pricings and cap-weighted indexes´ inefficiencies. However, fundamentally-weighted indices were compared to the market-cap weighted benchmark-index as a result. Rebalancing was done quarterly in order to avoid portfolio drifting away from the desired allocation.

2.3. Market environment

The financial crisis in 2008-2009 had crucial effects on worldwide economic environment. It also affected Baltic states, that, despite their political stability, high integration and pre-crisis economic growth were hit its challenges, remaining vulnerable towards the changes in global economic environment during the post-crisis recovery period. The biggest problem for the states were negative changes in the world trade, as former trade partner countries encountered decrease in the interest for foreign demand. This resulted in decrease in exports and also the reduction of domestic demand (Hansson, Randveer 2013). The crisis brought a serious recession with a decline in investment, a fall in the real estate prices and liquidity and pushed Baltic states to perform some fiscal changes in the public sector: increase labour productivity, decrease public wages and expenditures and make some other budget modifications. (Åslund 2011).

Fortunately, the recession period did not last for a long time and Baltic states stood out by their ability to recover from the crisis relatively fast compared to some other European countries. Already by year 2011 former export levels were gained and exceeded. Improvements took also place in form of decrease in indebtedness, increase of nominal wages, domestic demand and investment. It can be said that Baltic states have fully recovered from the financial crisis by now, and their economic situation is rather affected by current fluctuations in global economy. At this moment, the states can be characterized as countries with developed infrastructure, good level of human capital, confidence in security control and relatively good political and economic stability (Ellex 2018). The increase in the amount and growth in the activity of start-ups in last few years reflects a relatively good environment for starting new businesses. According to European Commission, Baltic states are appealing to foreign investors which has a great impact on states´ economies (2019). The increase of foreign capital inflows has created new workplaces and improved labour productivity as a result. Based on the improvements in last few years, it is believed that the states have positive outlook and overall good potential for further economic growth.

3. RESULTS

3.1. Performance of the Smart Beta strategies

In given research, low-risk, value- and liquidity-oriented strategies reflect stocks ´outperformance compared to the market-cap benchmark. High risk and size strategies, however, underperformed the benchmark. Table 2 represents a more concrete performance evaluation of all the strategies indices covering the research period and compares each strategy returns to the one of benchmark by marking under- and overperformance with "-" and "+" signs, respectively.

Table 2. Performance of Smart Beta indices compared to the benchmark (2008-2018)

Strategy	Metrics	Return	Performance compared to benchmark
Benchmark	Market capitalization	114.6%	-
Size	Revenue	13.9%	-101.7%
Leverage	Low risk	146.8%	+ 32.3%
Leverage	High risk	72.2%	-42.4%
Liquidity	Current ratio	153.6%	+39.0%
Value	Price to book	1070%	+955.4%
Value	EV/EBITDA	721%	+606.4%
Value	Price to earnings	334.8%	+220.2%

During the research period, the benchmark index earned a return of 114.6%. It means that if one would invest 1€ in the end of year 2008, he would earn a return of 114.6 € in 2018.

Figure 3 (below) shows how the benchmark and Smart Beta indices were performing over the research period relatively to each other. The starting point is 100 basis points.

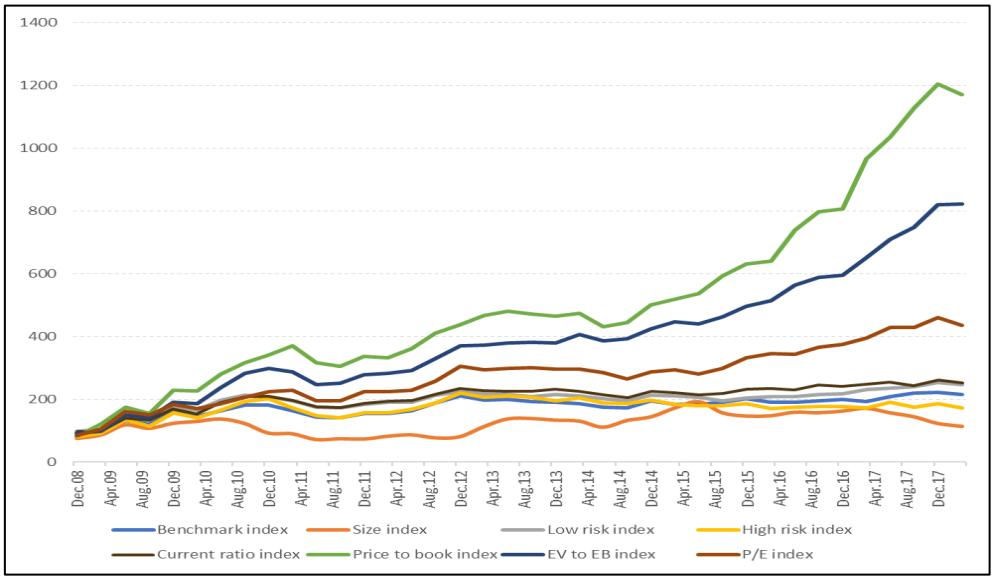

Figure 3. Performance of the indices consisting of 20 stocks (2008-2018)
Source: Compiled based on authors´ calculations

Table 3 represents how much, by using different strategies, would 1€ invested in the end of 2008 be worth in 2018. Also, quarterly and yearly average returns of the indices comprising of 20 stocks are provided for the years 2008-2018. The table also shows the standard deviation (volatility) of returns that indicate how much stocks´ returns were deviating from the average measure. Sharpe ratio was calculated to show the risk-adjusted performance of the strategies.

Table 3. Ending values of initial investment, quarterly and yearly average returns, volatility and Sharpe ratio* (2008-2018)

Strategy index	Ending value of 1€	Average quarterly returns (%)	Volatility (%)	Sharpe ratio *	Average yearly returns (%)	Volatility (%)	Sharpe ratio *
Benchmark	114.6	2.0%	10.7%	0.19	8.4%	20.0%	0.42
Size	13.9	0.3%	14.5%	0.02	1.4%	29.8%	0.05
Low risk	146.8	2.4%	9.3%	0.26	10.0%	21.6%	0.46
High risk	72.2	1.4%	12.9%	0.11	5.9%	26.1%	0.23
Current ratio	153.6	2.5%	9.8%	0.25	10.3%	21.0%	0.49
P/B ratio	1070.0	6.7%	14.0%	0.48	29.6%	31.0%	0.95
EV/ EBITDA	721.0	5.7%	11.4%	0.50	24.8%	29.6%	0.84
P/E ratio	334.8	3.9%	12.0%	0.33	16.7%	18.2%	0.92
Average		3.3%	12.0%	0.28	14.1%	25.3%	0.56

Source: Compiled based on authors´ calculations
Notes:

1. *Sharpe ratio is calculated as return divided by the standard deviation.

According to obtained results, Price to book-index would provide an investor with the highest return – 1070€ in case if 1€ was invested in the end of 2008. The Size-index provides the lowest general return of 13.9% or a quarterly return of 0.3%. If 1€ was invested in 2008, investor would only earn 13.9€ in ten years. As the size index has 14.5% of standard deviation which is the highest volatility measurement out of all, it can be considered as the worst of the strategies. Low risk index shows the lowest volatility measure of 9.3% which is 1.4% less than the one of the market-cap weighted benchmark. The Sharpe ratio explains the return compared to the risk that investment holds. A higher ratio reflects a better return performance compared to the risk that the investment holds. In this research, all value strategies resulted in a relatively good Sharpe ratio that indicates that they provide higher return for the same amount of risk. The size-index shows the lowest Sharpe ratio of 0.05 which is one more reason for being the weakest strategy.

Table 4 shows excess returns of the Smart Beta indices which were calculated by subtracting the benchmarks´ return from each strategy´ return.

Table 4. Quarterly performance of the indices and their excess returns in 2008-2018 (%)

Strategy index	Average quarterly returns	Excess return
Reference – benchmark	2.0	-
Size	0.3	-1.7
Low risk	2.4	0.4
High risk	1.4	-0.6
Current ratio	2.5	0.4
Price to book ratio	6.7	4.7
EV to EBITDA	5.7	3.7
Price to earnings ratio	3.9	1.9
Average:	3.3	1.3

Source: Compiled based on authors´ calculations

On average, quarterly return for the strategies was 3.3% which means that constructed indices outperformed the market-cap weighted benchmark by 1.3 % on a quarterly basis.

To provide a more detailed summary of each of the strategies, they will be further separately discussed:

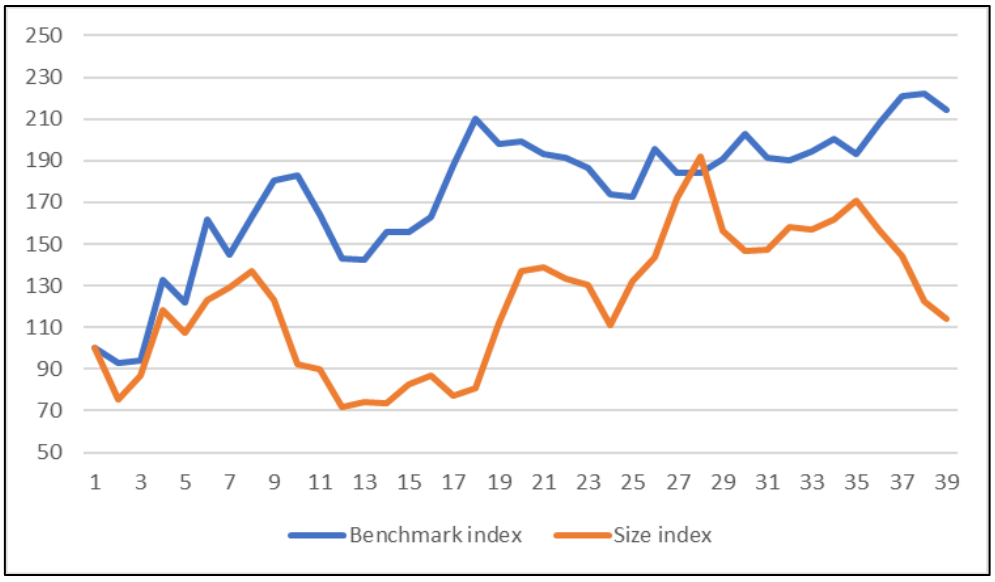

Figure 4. Size Strategy and Benchmark

During the whole research period, the “Size” strategy underperfomed the benchmark index by 101%. Quarterly average return for the “Size” index was 0.3% which means it underperformed the benchmark by 1.7%. The first reason for the underperformance could be that the “size” strategy is simply not good enough to overcome the returns that the benchmark earned and the expectations regarding the strategy were not met. Also, the reason for lower returns might be that revenue is not a good proxy for the “size” strategy as firms´ revenues might not be that strongly correlated with their size.

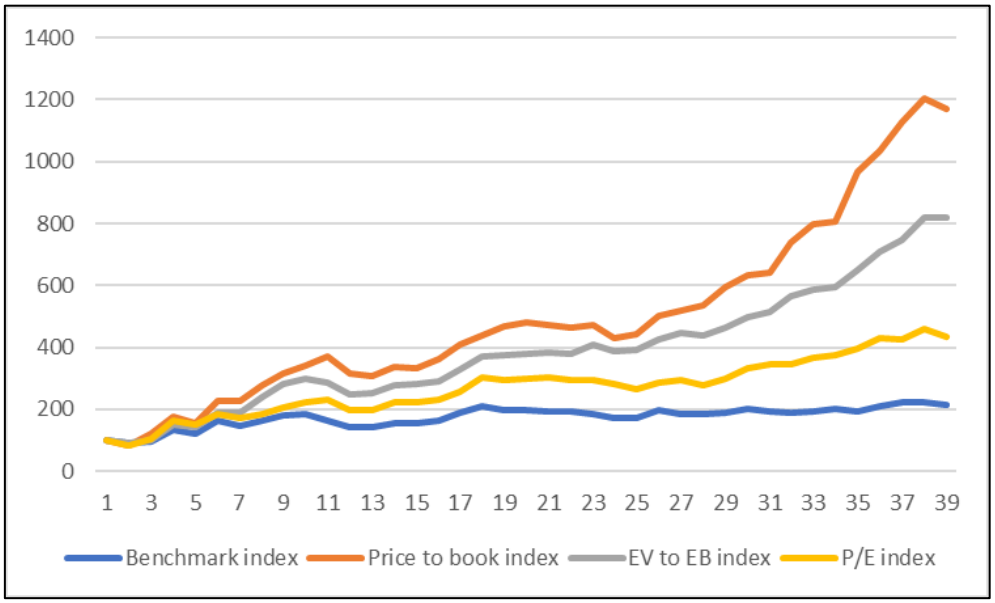

Figure 5. Value and Benchmark

Price to book, enterprise value to EBITDA and price to earning indices were created to implement the “value” strategy. While in the beginning of the research period the indices were moving in line with each other and did not experience any significant fluctuations, the biggest differences started occurring after the post-crisis recovery period. Price to book index earned an average quarterly return of 6.7% which is the highest return of all the indices. It outperformed the benchmark by 4.7% and is therefore the index with the best performance and highest yield. Enterprise value index has a quarterly average of 5.7% which is also a very good result considering that the benchmark earned just 2% of yield. The worst performer of “value”-factor strategy was price to book index which only earned 3.9% of quarterly return. However, it still has better outcome than the market-cap weighted reference index as it outperformed it by 1.9%. Overall, the “value” strategy comprising of three indices earned a quarterly excess return of 5.4% which exceeds the benchmark by 3.4%. This result is the best out of all of the strategies as it offers the highest yield.

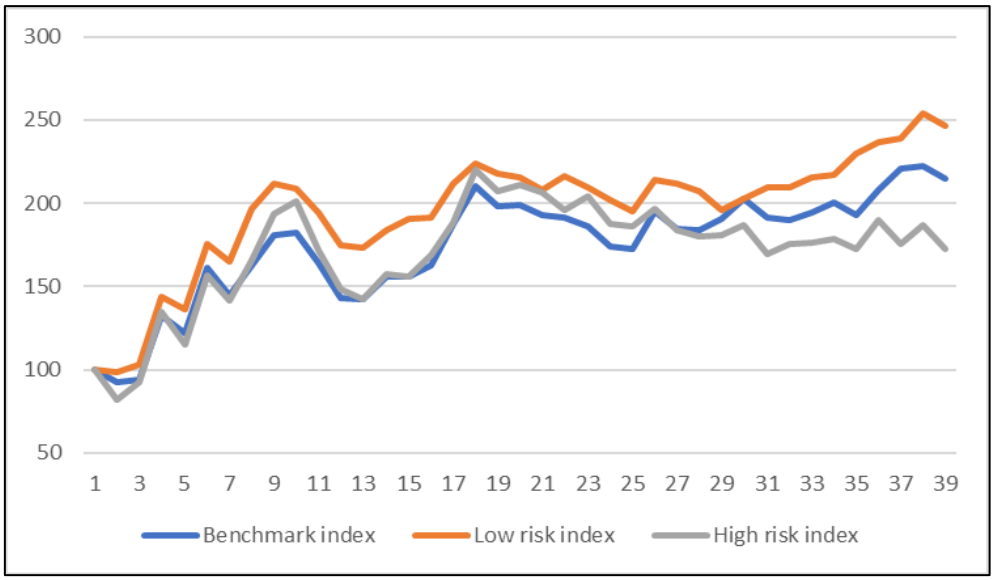

Figure 6. Leverage and Benchmark

Low risk index outperformed the benchmark by 32.3%, while high risk index underperformed the benchmark by 42.4%. The quarterly average return of the low risk and high risk index were 2.4% and 1.4%, respectively. The two strategies are controversial: first one assumes that low-risk stocks earn excess return and another assumes the opposite. Thus, it makes sense that their performances are obverse and move in opposite directions and such an outcome was expected. Compared to other strategies and their representative graphs, low- and high-risk strategies move quite closely to and in line with the benchmark.

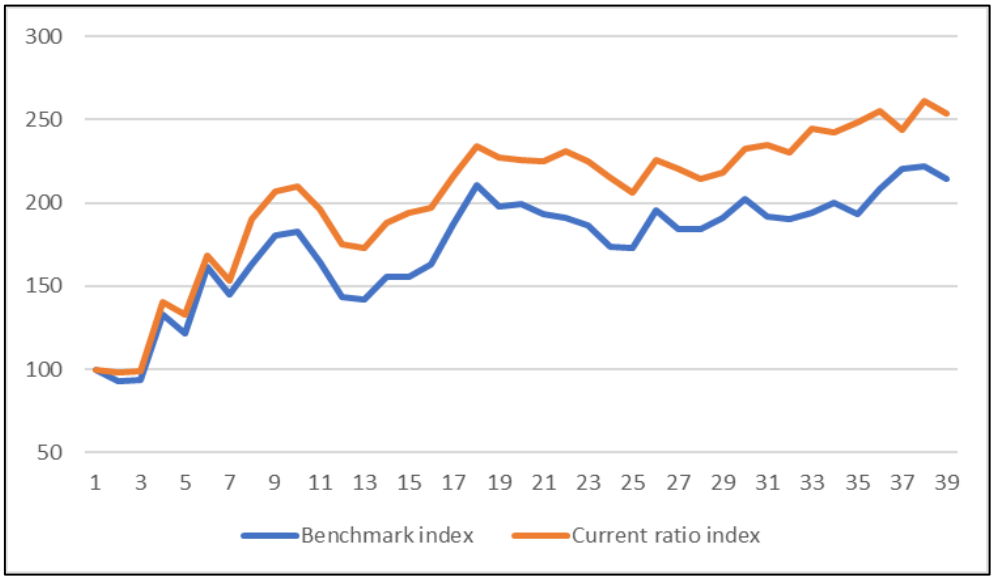

Figure 7. Liquidity and Benchmark

The index that was constructed based on current ratio factor overperformed the benchmark by 39% in the long run. On a quarterly basis, it earned an average return of 2.5% which exceeds the benchmarks´ performance by 0.5%. In this case, the lines that represent the benchmark and current ratio indices on the graph have similar shape, meaning that they reacted quite the same way to fluctuations in the market environment.

3.2. Post-crisis recovery effects

It is important to take into account crucial effects of financial crisis on worldwide economy in 2008. There is a chance that stock returns were influenced by the post-crisis recovery and they were "bouncing" back to their former pre-crisis stage. Hence, to get the fair data and to account for possible drawbacks, it is useful to test if results could be influenced by the recession. To prove that the results are not affected by the post-crisis recovery, a subperiod was tested and returns were recalculated for years 2011-2018, assuming that the recovery period for Baltic states lasted until 2011.

Table 5. Quarterly and yearly average returns, standard deviation and Sharpe ratio* (2011-2018)

Strategy index	Strategy return (%)	Average quarterly return (%)	Volatility (%)	Sharpe ratio*	Average yearly returns (%)	Volatility (%)	Sharpe ratio*
Benchmark	18.8	0.6	6.6	0.09	2.3	20.9	0.11
Size	-7.3	-0.3	13.4	-0.02	-1.0	31.6	-0.03
Low risk	16.4	0.5	4.8	0.11	2.0	21.0	0.10
High risk	-11.0	-0.4	7.9	-0.05	-1.5	27.6	-0.06
Current ratio	22.5	0.7	5.1	0.13	2.7	20.9	0.13
P/B ratio	270.8	4.5	7.0	0.64	19.1	32.0	0.60
EV/EBITDA	189.3	3.6	6.1	0.59	15.2	31.0	0.49
P/E ratio	111.5	2.5	6.8	0.37	10.5	15.5	0.68
Average		1.6	7.3		6.71	25.6	

Source: Compiled based on authors´ calculations

When comparing two subperiods (2008-2018 and 2011-2018), it can be noticed that overall average returns do not vary significantly. Highest changes occurred with the Price to book and EV to EBITDA indices that lost 2.2% and 2.1% of quarterly returns, respectively. The smallest change happened to size index that only diminished by 0.6% in a quarter. Overall, the average quarterly return of the strategies resulted in 1.6% which is twice less than for the initial research period. However, strategies still outperform the benchmark and it can be concluded that the results are not significantly affected by the post-crisis recovery period.

3.3. Transaction costs

When investing in financial markets, several transaction costs occur related to trading stocks. Transaction costs usually include the cost of investing, brokerage charges, taxes and some other fees (Wang 2003). Because Smart Beta strategies choose to weight stocks differently than based on market capitalization, transaction costs are especially probable to incur. Normally, they account for 2-3% per year (Mariathasan 2017). Hence, to make the research more realistic, 2% of transaction costs were included into research to see if they influence the overall outcome of stock returns and whether it will result in underperformance compared to the benchmark.

Table 6. Strategies´ returns with and without transaction costs in years 2008-2018 (%)

Strategy index	No transaction costs	Transaction costs (2%)	Average quarterly returns	Average yearly returns
Benchmark	114.6	114.6	2.0	8.4
Size	13.9	11.6	0.3	1.2
Low risk	146.8	141.9	2.4	9.7
High risk	72.2	68.7	1.4	5.7
Current ratio	153.6	148.5	2.4	10.1
P/B ratio	1070.0	1046.6	6.6	29.3
EV/EBITDA	721.0	704.6	5.6	24.5
P/E ratio	334.8	326.1	3.9	16.5

Source: Compiled based on authors´ calculations

The biggest change caused by including the transaction costs happened with the "Price to book" strategy where the return diminished by 23.4% in long term. The "size" strategy, however, changed only by 2.3%. It can be noticed that strategies with highest returns experienced biggest changes because of the transaction costs. Average yearly and quarterly returns did not incur any significant changes and none of the strategies that were outperforming the benchmark before including the transaction costs experienced such significant changes that would cause the underperformance afterwards.

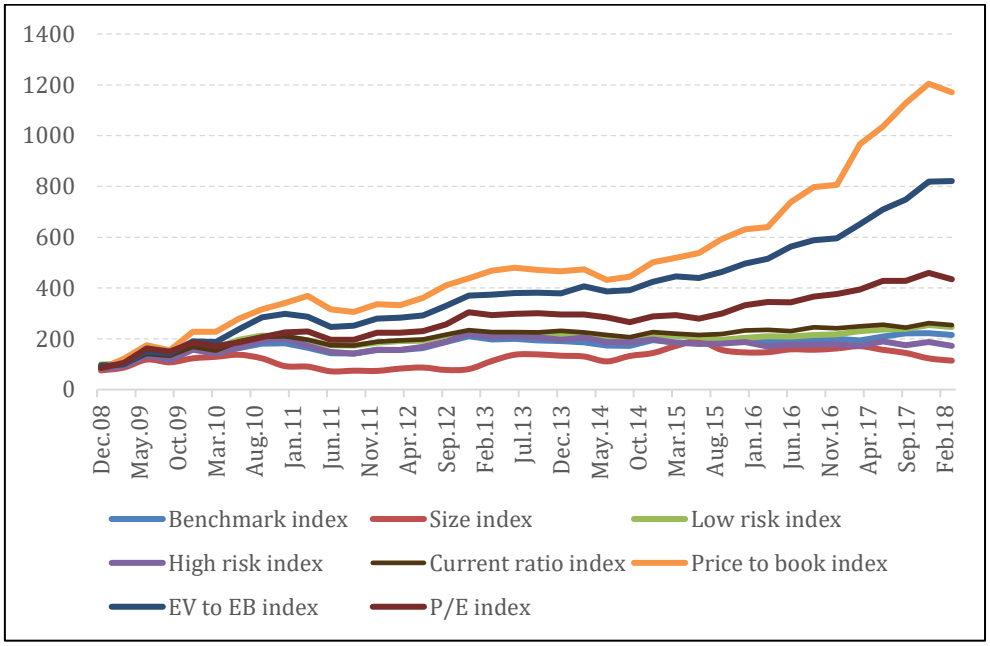

Figure 8. Smart Beta and the Benchmark no transaction costs

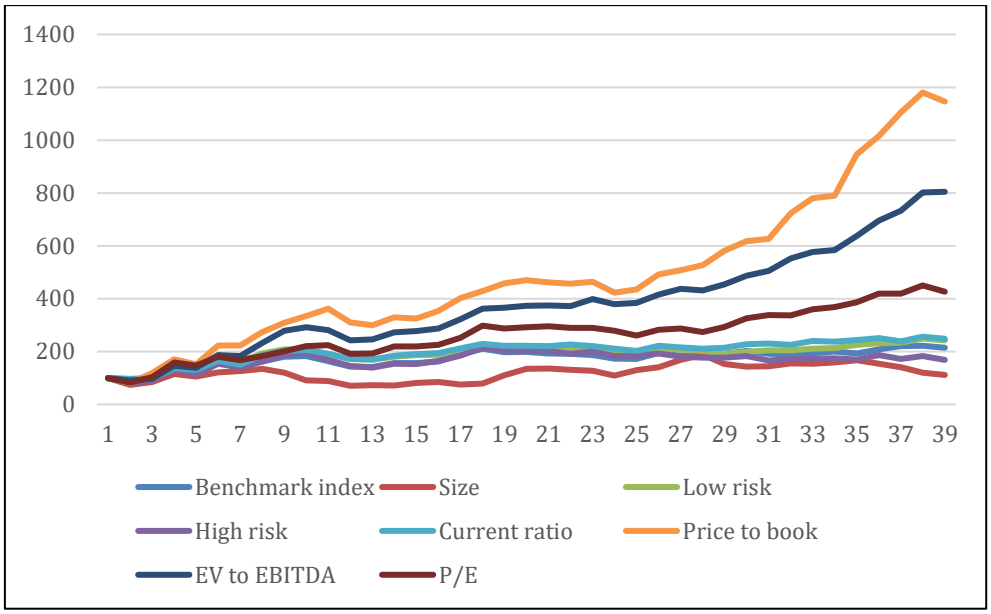

Figure 9. Smart Beta and the Benchmark 2% transactions cost assumed

As it can be seen from the graphs above, transaction costs shifted the lines that represent Smart Beta strategies downwards but did not have a straight influence on overall results: those that were underperforming and overperforming stayed the same.

3.4. Statistical significance

To test that obtained results are valid and not just gained by chance, it is useful to perform the T-test that is used for hypothesis testing. The null hypothesis that needed to be rejected is that the two samples have equal hypothetical means equal to 0. In this research, T-statistics reflects how statistically significant excess returns are. Statistical significance was tested at alpha level of 5% (criterion level for acceptance) assuming normal distribution, and in case of P-value exceeding 5% (0.05), the results are not statistically significant and are considered just by chance. As a result, the P-values of three strategies are less than 5% which indicates that the obtained results are valid and statistically significant. Table 7 shows the T-statistics of excess returns and P-values for each strategy. “Yes” in the “Significance” row indicates that the results are valid and are not just by chance.

Table 7. T-statistics of excess returns and statistical significance of obtained results

Strategy index	Average quarterly returns (%)	Excess return (%)	T-statistics of excess return	P-value	Significance
Benchmark	2.0	-	-	-	-
Size	0.3	-1.7	-0.48	0.683	No
Low risk	2.4	0.4	0.36	0360	No
High risk	1.4	-0.6	-0.43	0.664	No
Current ratio	2.5	0.4	0.53	0.299	No
P/B ratio	6.7	4.7	3.27	0.001	Yes
EV/EBITDA	5.7	3.7	4.90	0.000	Yes
P/E ratio	3.9	1.9	1.98	0027	Yes

Source: Compiled based on authors´ calculations

As a result, it can be inferred that at confidence level of 95%, three strategies have outperformed the benchmark.

3.5. Limitations of the research and recommendations for further research

Smart Beta is a rules-based fund-construction method that selects stocks with certain financial characteristics instead of using market-capitalization weighting. Firstly, despite Strategic Beta increase in popularity, it still has relatively low trading volumes. This might result in a situation where it is difficult for the investor to buy and sell the funds according to his preferences. Because many aspects need to be considered with Smart Beta funds, there is a large probability that funds are hard or even impossible to trade.

Smart Beta includes both passive and active investing. The „active“ part attempts to beat the market by analyzing past performances and, thus, involves higher fees which may become quite costly in long-term.

The second limitation concerning the research is that 29 stocks out of 80 were left out of the universe because of the missing fundamental data. This amount is almost a third of the whole data universe. Therefore, created strategies are not fully representing the whole Baltic region and the results are not entirely realistic. It is possible, that the entire data would give different or even opposite results.

Also, even though the research period (2008-2018) was divided into quarters which gave 39 subperiods for strategies´ creation, it does not include the pre-crisis time. Hence, it is impossible to say whether the strategies are overperforming their pre-crisis performance or the research results – even if overperforming the benchmark – are much worse than they had been before the research period. Furthermore, it is difficult to note the procyclical feature of chosen factors.

Finally, according to Vanguards´ Jack Bogle, even though Smart Beta has shown outperformance compared to the benchmark in the past, it has not yet been tested during the times of tough market environment (Jones 2017). Hence, it is difficult to say whether it will overcome the difficulties of market shock and overperform the benchmark as a result. This research is using back-testing method and is conducted based on historical data of stock characteristics. No matter negative and positive results of the strategies, models built on previous performance are not guaranteeing future success.

The main suggestion for future is to include more Baltic stock market representatives into the research to have a larger dataset and a wider base for making inferences about the outcomes. Also, better conclusions could be made about factor performances during different times of changing market environment. Longer research period would allow to see the total effect of crisis (pre-, during-, post-crisis). Therefore, author would suggest to take a larger time frame as a base for the further research.

CONCLUSION

Market-capitalization weighting method is known as a traditional weighting method for a long time and is still used nowadays. It assumes weighting and ranking stocks based on their market capitalization and giving highest weights to stocks with largest market capitalization.

The purpose of this research was to find out whether and how well Smart Beta strategies are performing on Baltic stocks. Strategies were tested on a research period from 31.12.2008 to 30.06.2018 and included 39 quarters in total. When constructing indices, such strategies as factor-investing and fundamental-weighting were used. Chosen factors to be targeted were size, value, liquidity and leverage. To allocate weights to stocks in the indices, financial fundamentals such as revenue, debt to total assets, total assets to debt, price to book, price to earnings, enterprise value to EBITDA and current ratio were used. After constructing the single-factor indices including 20 stocks, their results were compared to the market capitalization weighted benchmark index.

The overall results showed that chosen strategies and constructed indices outperformed the market-cap weighted benchmark index. The constructed strategies yielded with excess returns in range of -1.7% to 4.7%. The average return for all the strategies was 3.3% which indicates strategies´ outperformance of the benchmark by 1.3% on a quarterly basis. The average volatility of the strategies was 12% while the one of the reference index was 10.7%. The underperforming strategies were Size and High risk with overall returns of -101% and -42% during the research period compared to the benchmark, respectively. Considering that the "Size" index underperformed the benchmark by 1.7% on a quarterly basis and resulted in highest volatility measure, it shows the worst performance of all the strategies. Firms´ revenues were used to create the "size" index and it is possible that its´ underperformance does not definitely signify a bad strategy, as the result could also be because revenue is not the best indicator to reflect the size of the company. The overperforming indices turned out to be Low risk, Current ratio, Price to book, Enterprise Value to EBITDA and Price to earnings. The best strategy of outperformers was Price to book which earned a total return of 1070% an average quarterly return of 6.7%. As the market-

cap weighted Reference-index earned 2% of quarterly return, the Price to book yielded in excess return of 4.7% which is the highest excess return of all the strategies.

The quarterly and annual returns were recalculated for 2011-2018 subperiod to see if post-crisis recovery had any effects. As a result, the returns did not vary a lot and the recovery time did not influence the strategies´ returns much. In reality, transaction costs are expensed because of the trading, brokerage and investing fees. After including transaction costs of 2%, the overall results did not change. Those that were overperforming before, remained doing so. The biggest change occurred with the Price to book strategy that lost 23.4% in a whole research period. However, it only diminished by 0.1% on a quarterly basis which is not a significant loss.

Significance test was performed to make sure that obtained results for the strategies are valid and achieved not just by chance. On an acceptance level of 5%, three strategies overperformed the benchmark as their P-values exceeded the criteria in T-test. These were Price to book, EV to EBITDA and Price to earnings strategies which were all targeting the "value" factor. The four remaining strategies are not statistically significant as their P-value did not meet the acceptance criteria.

Research limitations are discussed in detail in paragraph 3.5. One of the limitations is that combining fundamental indexation and factor-investing is more costly compared to the traditional market-cap weighting method. However, as the "active investing" or costly part of Smart Beta assumes just the thorough analysis and research of stocks, the expenditures should not be significant. The main restraint is that the complexity of indices built by using Smart Beta strategies might end in a situation where it is impossible for an investor to trade the position whenever it is preferred. The suggestion for further research is to account for a longer time period to note the procyclical nature of factors. Also, 29 stocks were left out of the stock universe and 20 stocks out of remaining 51 were included into the index. A larger amount of stocks in a fund construction could be used to provide a higher diversification and larger base for making inferences as a result of the research. Finally, it is good to remember that the research has been conducted based on historical data and the obtained results are not guaranteeing future success.

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