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MOMENTUM IN THE BALTIC STOCK MARKET

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Abstract

This study investigates whether momentum effect can be explained by the three Fama-French factors, when cross-sectional returns of the stocks in the Baltic stock market (BSM) are analyzed. Findings confirm results for the US stock market that the Fama-French factors cannot explain momentum returns. The monthly returns of 8 Latvian, 13 Estonian, and 27 Lithuanian company stocks are analyzed for the time period from June 2002 till February 2010 using the methodology presented in Fama and French (1996). This study also shows that momentum and value investing strategies should be applied separately as adding momentum sort to the Fama-French factor portfolios actually reduces their average returns. The study builds upon results derived in Lieksnis (2010) which proved statistical significance of the Fama-French model to explain cross-sectional returns in the BSM.

Keywords: Momentum, Fama-French three-factor model, asset pricing, Baltic stock market, cross-sectional stock returns.

JEL Classification: G12, G15.

Introduction

In the wake of the worldwide financial crisis Baltic stock exchanges have performed exceptionally well with the OMX Baltic benchmark index increasing by 70% in 2010. However, despite their stellar performance, the exchanges continue to face low turnover and lack of new listings. One of ways to overcome this problem and increase popularity of equity investing among both institutions and individuals in the Baltic countries is to implement research about profitable methods to invest in shares listed in the Baltic stock exchanges. This study aims to extend knowledge about ways to make profitable long-term investments in the Baltic equity markets.

The Capital Asset Pricing Model (CAPM) remains one of the most widely accepted theories in the asset pricing area of modern finance, which in turn provides scientifically tested tools to equity investors. The classical, one-factor CAPM postulates that the expected return of any stock depends on its beta or regression slope coefficient against return of the market index. This model has not performed well in the extensive empirical tests and is today replaced by another, more advanced, three factor Fama-French asset pricing model by Fama and French (1993). This model states that, in addition to the market index, the expected stock returns also depend on size of a company measured by its market capitalization as well as its book/market (B/M) ratio (ratio of company's book value of equity to its capitalization). A number of other independent variables have been proposed to augment Fama-French model since its introduction in 1993. Jegadeesh and Titman (1993) introduced stock price momentum as another variable to explain cross-sectional returns of stocks. Authors concluded that zero-cost winners-minus-losers portfolio selected on the basis of their past 6 month performance realized compounded excess returns averaging 1% per month. In a follow-up study, Fama and French (1996) concluded that momentum effect cannot be explained by the three Fama-French factors. They analyzed monthly US stock returns for years 1966 to 1996 sorting stocks into 10 portfolios each month according to their past short-term and long term returns. The difference between average monthly returns for the first and tenth decile with a 12-month look-back was 1.31%. Each of ten momentum time series was then regressed against the three Fama-French factors. The regression intercepts were strongly negative for short-term losers and strongly positive for short-term winners indicating strong explanatory power of the momentum factor. Rouwenhorst (1998) confirmed existence of the momentum effect in Western European stock markets by researching stock prices of 12 countries for 1978 to 1995 and find the average 1% monthly outperformance in line with findings of Jegadeesh and Titman for the US market. Rouwenhorst (1999) analyzed momentum effect in 20 emerging markets for years 1982 to 1997 generally confirming its presence. From twenty analyzed markets only in six of them there was statistically significant momentum effect.

Although value and momentum are the two most significant variables to explain cross-sectional returns of stocks, a few researchers have investigated interaction between these variables, i.e., if both of them should be used at the same time to choose the best stocks for investment. One of such investigations was done by ex-CEO of Goldman Sachs Mr. Clifford Asness in Asness (1997). Author used monthly dataset of all public US companies that traded in the major US stock exchanges from July 1963 through December

1994. Portfolios were created by independently sorting all stocks into five portfolios depending on their 12-month return momentum and book/market ratio creating two sets of five portfolios and then combining sort results creating 25 portfolios. Winner momentum portfolio had an average monthly return of 1.48%, and value portfolio of high B/M ratio stocks produced return of 1.36%. High B/M ratio, momentum loser (HL) portfolio produced average monthly return of 0.03%; high B/M ratio, momentum loser (HW) portfolio yielded 1.5%; low B/M ratio, momentum loser (LL) portfolio yielded 1% and low B/M ratio, momentum winner (LW) portfolio yielded 1.62%. As we can see, combining both strategies produced only marginal improvements in the average returns. Winner portfolio yielded the same returns as HW portfolio and adding the momentum sort increased value portfolio return from 1.36% to 1.5%. Author concluded that both variables were negatively correlated. Value strategies failed for companies with strong momentum and momentum strategies worked only for growth stocks with low B/M ratio. Author did not include company size and stock beta in the analysis thus failing to test the complete Fama-French three factor model in terms of its interaction with stock price momentum.

Validity of the Fama-French three factor model to explain cross-section returns of stocks traded in the Baltic Stock Market (BSM) was confirmed by Lieksnis (2010). Three studies analyzed presence of the momentum effect in the CEE and Baltic stock markets. Avižinis and Pajuste (2007) studied a sample of stock market returns for 7 CEE countries: the Baltic States, Poland, Slovenia, Hungary, and Croatia for time period from January 2002 to December 2006 using the methodology of Jegadeesh and Titman (1993). The most pronounced momentum effect was found for time periods of 6 months of portfolio formation and 6 months for subsequent abnormal returns with average monthly return of 3% for winner-minus-loser portfolio. Maniušis and Urba (2007) used similar methodology to analyze weekly stock prices of 71 companies listed in the BSM using dividend adjusted weekly closing stock prices from the REUTERS database for the time period from 2000 to 2006. Results showed statistically significant returns for all chosen period combinations of average future returns and average past returns (3, 6,9,12 months). The best performing strategies achieved average monthly winner-minus-loser returns of about 0.5% with portfolio formation time of 3 and 12 months and portfolio holding period of 3 months. Finally, Kivistik and Mandell (2010) explored five-factor regression model with the standard Fama-French three-factor specification augmented by two independent variables – long-short portfolio returns for liquidity and momentum. Dataset of monthly prices for 203 stocks from Estonia, Latvia, Poland, Hungary and Czech Republic was analyzed for time period from January 2006 until December 2009. Authors did not find statistically significant slope coefficients for momentum and liquidity, but achieved low regression intercepts and high regression R^2.

As we can see, none of the three studies of momentum effect in the BSM analyzed it in the context of the Fama-French factors. Both Avižinis and Pajuste (2007) and Maniušis and Urba (2007) did not explore impact of momentum factor to the Fama-French three factor model at all and used long-short momentum factor portfolio as the only factor to explain cross-sectional returns of the Baltic stocks. Kivistik and Mandell (2010) analyzed momentum jointly with liquidity factor and did not perform a separate study for momentum effect alone. Thus, the objective of this study is to fill the gap in the empirical literature and to confirm presence of momentum effect in the BSM after adjustments for the Fama-French factors using the methodology proposed by Fama and French (1996) to check its statistical significance as well employing additional factor portfolio sorts on momentum factor proposed by Liew and Vassalou (2000) to confirm its economic significance.

Methodology

As our goal is to determine if momentum effect is still present after controlling for the three Fama-French factors, we need to evaluate the best methodology to do it. First we need to start with the general Fama-French model specification as proposed in Fama and French (1993). Authors measured the size factor in each period as the differential return on small capitalization firms versus large capitalization firms. This factor is usually called SMB (for “small minus big”). Similarly, the other factor was measured as the return on firms with high book-to-market ratios minus that on firms with low ratios, or HML (for “high minus low”). The Fama-French three-factor asset pricing model can be specified as:

$$r_{jt} = \alpha_j + \beta_j r_{mt} + s_j SMB_t + h_j HML_t + u_{jt}, \quad t = 1,2,\ldots, T \qquad (1)$$

where SMB and HML are returns on value-weighted, zero-investment, factor-mimicking portfolios for capitalization and book-to-market ratio, r_{jt} - portfolio excess returns over the risk-free rate, and r_{mt} – excess return of the stock market index. According to the arbitrage pricing model, if the three relevant factors fully explain asset returns, the intercept of this regression should be zero. There are two approaches to determining

if momentum can be explained by the three factors in (1). The first approach was used by Fama and French (1996) and Jegadeesh and Titman (2001). In both cases datasets of monthly stock returns were sorted into multiple portfolios according to the short-term momentum of stock prices creating winner and loser portfolios and portfolio excess returns r_{jt} calculated. After that regression (1) was calculated for each of these momentum portfolios and regression alphas recorded. In both cases regression alphas increased in proportion to rank of portfolio and were statistically significant indicating the fact that momentum effect cannot be explained by the Fama-French factors. Fama and French rebalanced momentum portfolios each month using the cumulative returns for the previous 11 months skipping the portfolio formation month to reduce bias from the bid-ask bounce. Ten equal-weight portfolios were formed. The difference in monthly average returns between extreme loser and winner portfolios was 1.31%. Table 1 summarizes regression results for all ten momentum portfolios for regression (1).

Table 1. Three-Factor Regressions for Monthly Excess Returns, 366 Months

Portfolio	**Alpha$_i$, (t-stat)**	**Beta$_i$, (t-stat)**	**s$_i$, (t-stat)**	**h$_i$, (t-stat)**	**R^2**
P1 (loser)	-1.15 (-5.34)	1.14 (21.31)	1.35 (17.64)	0.54 (6.21)	0.75
P2	-0.39 (-3.05)	1.06 (33.36)	0.77 (16.96)	0.35 (6.72)	0.85
P3	-0.21 (-2.05)	1.04 (42.03)	0.66 (18.59)	0.35 (8.74)	0.89
P4	-0.22 (-2.81)	1.02 (51.48)	0.59 (20.87)	0.33 (10.18)	0.92
P5	-0.04 (-0.54)	1.02 (61.03)	0.53 (22.06)	0.32 (11.86)	0.94
P6	-0.05 (-0.93)	1.02 (73.62)	0.48 (23.96)	0.30 (13.16)	0.96
P7	0.12 (1.94)	1.04 (68.96)	0.47 (21.53)	0.29 (11.88)	0.95
P8	0.21 (3.08)	1.03 (62.67)	0.45 (19.03)	0.23 (8.50)	0.94
P9	0.33 (3.88)	1.10 (51.75)	0.51 (16.89)	0.23 (6.68)	0.92
P10 (winner)	0.59 (4.56)	1.13 (35.25)	0.68 (14.84)	0.04 (0.70)	0.86

Source: Fama and French (1996).

As we can see, regression alphas increase in almost liner fashion going from momentum loser to momentum winner portfolios confirming the hypothesis that the three factors cannot explain stock return momentum. Jegadeesh and Titman also rebalanced portfolios each month, but employed 6 month lookback period and overlapping portfolios – a momentum decile portfolio in any particular month holds stocks ranked in that decile in any of the previous six ranking months. Authors also created ten equal-weight portfolios.

The second approach to check for the momentum effect in the context of Fama-French factors is to add momentum long-short portfolio as another independent variable in (1). This approach was pioneered by Carhart (1997) and used to check performance of mutual fund managers. Carhart created the momentum factor by sorting all stocks according to their past eleven month returns without taking into account their size or book-to-market ratios and then subtracting returns of the lowest 30% of performers from returns of the highest 30% performers. Liew and Vassalou (2000) used the four-factor Carhart model to investigate ability of these factors to predict GDP growth. Momentum winners-minus-losers portfolio was rebalanced each year using the previous year's stock returns. In order to make factor portfolios orthogonal, authors employed unique sorting approach. They first sorted stocks into three book-to-market portfolios, then sorted stocks within each of them by size to create nine portfolios (the standard Fama-French approach would be to employ independent rather than sequential sorts). Finally each of these nine portfolios was sorted by momentum to create 27 portfolios. The drawback of this approach is that composition of each portfolio depends on the order stocks are sorted. Authors calculated the following average annualized returns for factor portfolios for the US market: HML – 6.74%, SMB – 6.45%, WML – 5.05% for annual rebalancing; HML – 7.99%, SMB – 10,73%, WML – 15.02% for quarterly rebalancing. As we can see, WML is much

bigger, when quarterly rebalancing is employed. L'Her et al. (2004) applied the four-factor model to explain cross-section returns in the Canadian market. Authors did three independent sorts on size, book-to-market ratio, and 11-month momentum skipping the last month. Momentum portfolios were created to be orthogonal to size, but not to book-and-market ratio, creating big-winners-minus-losers and small-winners-losers portfolios. Winner-minus-loser portfolios were created using top 30% and bottom 30% of stocks sorted by their cumulative returns. With annual rebalancing authors derived values for average annualized SMB and HML factors return to be only 5.08%, with WML premium being 16.07%. Lam et al. (2009) used similar procedure for portfolio formation to analyze cross-sectional performance of the Hong Kong stock market. They added WML as another factor in (1) obtaining the following specification:

$$r_{jt} = \alpha_j + \beta_j r_{mt} + s_j SMB_t + h_j HML_t + w_j WML_t + u_{jt}, \quad t = 1,2,\ldots, T \qquad (2)$$

The regression results with 25 size and book-to-market portfolios showed that out of 25 intercepts, 21 were not significantly different from zero at the 5% level of significance. Most of WML factors were statistically insignificant and there is no clear relationship between WML factors and the 25 factor portfolios. Finally, Kivistik and Mandel (2010) added the long-short liquidity factor to (2) and calculated results of this regression for 25 size and book-to-market portfolios for the CEE stocks. Long-short factor portfolios were created using the same methodology as in Lam et al. (2009) and similar results were obtained – only one out of 25 regression results showed statistically significant slope coefficient for WML factor. Besides, 21 out of 25 regression intercepts were not significantly different from zero.

The data and empirical results

Research is performed using the dataset first analysed by Lieksnis (2010). For that study capitalization and book values as well as monthly stock prices of 8 Latvian, 12 Estonian, and 28 Lithuanian companies with acceptable liquidity (measured by the minimum number of stock sales transactions of 600 deals per year) for time period from 2002 to 2010 were obtained from www.nasdaqomxbaltic.com. Four portfolios were created: high B/M ratio, big capitalization companies (BH portfolio), high B/M ratio, small capitalization companies (SH portfolio), low B/M ratio, big capitalization companies (BL portfolio), and low B/M ratio, big capitalization companies (SL portfolio). Portfolios were rebalanced each June in line with book value and capitalization at the end of the previous year. Using the standard Fama-French approach, value-weighted, zero-investment, factor-mimicking portfolios for capitalization and B/M ratio (SMB and HML portfolios) were created using EONIA rate and OMX Baltic market index as proxies for the risk-free rate and stock market index.

We use the dataset to create multiple portfolios of stocks according to their return momentum. Fama and French (1996) approach is generally followed, although five rather than ten portfolios are created reflecting a small number of stocks in the BSM sample. Each month stocks are sorted into five portfolios according to their cumulative returns during the previous six months skipping the last month to avoid bid-ask bounce effect, and their monthly returns recorded. Excess returns over the risk-free rate of resulting five portfolios were then used as dependent variables in (1) to calculate regression results. Table 2 summarizes the resulting intercept and slope coefficients.

Table 2. Results of three-factor regressions of momentum portfolios for the Baltic stock market

Portfolio	Average excess return	$Alpha_i$, (p-value)	$Beta_i$, (p-value)	s_i, (p-value)	h_i, (p-value)	R^2
P1 (loser)	-1.53%	-1.41 (0.35)	0.69*** (7.4E-5)	0.25 (0.3)	-0.39 (0.11)	0.19
P2	0.26%	-0.43 (0.70)	0.64*** (7.4E-7)	0.4** (0.03)	0.0056 (0.97)	0.26
P3	0.82%	0.01 (0.99)	1.02*** (9E-26)	0.3*** (0.003)	-0.055 (0.57)	0.74
P4	1.83%	0.95 (0.20)	0.96*** (7E-20)	0.23* (0.055)	0.014 (0.9)	0.63
P5 (winner)	1.5%	0.35 (0.81)	0.87*** (3E-7)	0.55** (0.021)	0.11 (0.62)	0.27

Source: author's calculations.

*Notes: A p-value below 0.01 indicates statistical significance at the 1 percent level and is marked with ***. ** indicates significance between 1 and 5 percent and * indicates significance between the 5 and 10 percent levels.*

As we can see from the table, the increase in regression Alphas going from the loser to winner portfolios is not uniform, unlike Fama and French (1996) where it is almost linear, as we can see in Table 1. Besides, HML factor at least partially explains the momentum effect, with the increasing slope coefficient, and regression R^2 are very low. One explanation for these discrepancies could be a small dataset which reduces the power of regression.

Next we check the ability of a momentum sort to increase returns of the four original portfolios BH,SH,BL, and SL. Modifying the methodology proposed by Liew and Vassalou (2000) to a situation of much smaller number of stocks, each six months we sort each of these four portfolios into two new portfolios according to aggregate returns for previous six months of stocks they contain. Average value-weighted excess returns over the risk-free rate of the resulting eight portfolios together with the original four are summarized in Table 3.

Table 3. Average monthly excess returns of momentum sorts for the Fama-French portfolios

Portfolio	BL	BH	SL	SH
Unsorted portfolio, excess returns	-0.54%	1.44%	-0.58%	1.77%
Sorted, loser	-1.18%	1.02%	-2.67%	1.12%
Sorted, winner	0.38%	0.58%	0.87%	1.08%

Source: Lieksnis (2010), author's calculations.

As we can see, sorting by the past stock return momentum does improve performance of growth stock portfolios with low book-to-market ratios, but actually diminish performance of the value stock portfolios. Comparison of average monthly excess returns over a risk-free rate of resulting portfolios shows that sorting by the past stock return momentum does improve performance of growth stock portfolios with low book-to-market ratios (average monthly excess returns increase to 0.38% and 0.87% for momentum-sorted BL and SL portfolios), but actually diminish performance of the value stock portfolios (average returns drop to 0.58% and 1.08% for BH and SH portfolios). Figure 1 depicts results of investing 10,000 EUR in the market index portfolio, winner portfolio P5 (see Table 2) and SH portfolio derived in Lieksnis (2010).

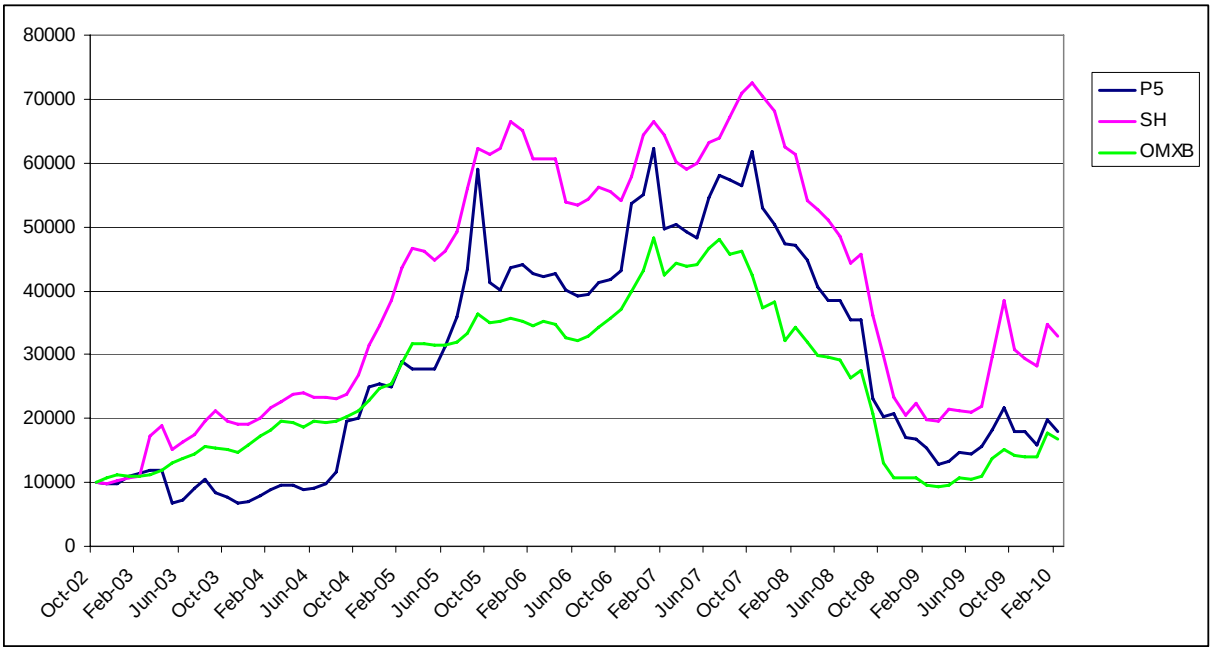

Figure 1. Value of 10,000 EUR investment in the market, P5, and SH portfolios
Source: Lieksnis (2010), author's calculations

As we can see, the higher average return of SH portfolio as compared to winner momentum portfolio P5 results in the better monetary performance. However, during the bear market of 2007 and 2008 both portfolios suffered losses as the global financial meltdown reduced prices of the equity securities all over the world.

Conclusions

We can draw the following main conclusions from the study:

- Momentum effect can be at least partially explained by one of the Fama-French factors – book-to-market ratio, when stock returns of the Baltic Stock Market are analysed. The average monthly return of the winner stock portfolio containing stocks which increased in price over the previous six months is only 1.5% as we can see from Table 2. This is lower than the average monthly excess return 1.77% of the winning SH portfolio obtained in Lieksnis (2010).
- Combining momentum investing strategy with value investing strategy can lead to inferior performance results so investors are advised to choose one of them when making stock selection choices for their BSM stock portfolios. Although both strategies produce superior results, value investing is more profitable than momentum strategies in the Baltic Stock Market.

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