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CONTRARIAN STRATEGY RISKS ON THE WARSAW STOCK EXCHANGE

Summary: Selling winners stocks and simultaneously buying losers stocks constitute the core of contrarian strategies. The author investigates risks of contrarian investments strategies in Warsaw Stock Exchange. Winners and losers stocks are identified on the basis of monthly trading volume and return features. Overlapping six years periods method was used for building portfolios at yearly intervals, guaranteeing their elasticity. Contrarian portfolio risk was evaluated with time-varying beta coefficients values. The contrarian portfolios had leverage induced risk in Warsaw Stock Exchange between 2003-2013.

Keywords: Stock markets, contrarian portfolios, winner-loser strategy risk.

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1. Introduction

The relationship between risk and profit is a key element when evaluating financial assets. Many researchers, such as Fama, Schwert (1977), French, Schwert and Staumbaugh [1987], and Campbell and Hentschel (1992), have been investigating this issue, without however coming to uniform results, except establishing the compatibility between bonus and risk level. This matter becomes particularly important for contrarian strategies[1] which reach much higher excess returns than the market ones. De Bondt and Thaler, Fama, French, Lakonichok, and Shleifer and Vishny studied this phenomenon, however they did not manage to reach a consensus. La Porta, Lakonichok, Shleifer and Vishny (1997) explained the high profitability of contrarian strategies by the "expectational errors" of naive investors.[2] However, Fama and French (1992) and Chan and Chen (1988) argued the high profitability resulted from an investment bonus in more risky stocks. Lakonichok, Shleifer and

[1] Contrarian investing consists in buying losing stocks (*losers*) and simultaneously selling winning stocks (*winners*, glamour), whose prices are not part of an upward trend.

[2] Variables used for the classification and glamour portfolios allow for anticipating expectational errors.

Vishny (1994), La Porta (1996) and La Porta and Lakonichok, Shleifer and Vishny (1997) disagree with the aforementioned researchers, stating that a higher profitability of contrarian stocks does not result from a higher relative risk. They explain it pinpointing at the results stating that, after the first year, loser portfolios are worth more than glamour portfolios. Balvers, Wu, and Gililand (2000), Nam, Pyun, and Avard (2001). Tkac [1999] and Wongchoti and Pyun (2005) established that the variability of stock prices was often accompanied by the variability of trading volume, and that the trading volume was what allows investors to predict their reactions. There are many publications dedicated to contrarian strategies on different markets. Mun, Vasconcellos and Kish [1999] established that short-term contrarian portfolios worked best on the French and German stock markets. Hameed and Ting [2000] came to the conclusion that contrarian portfolios on the Malaysian market were positively correlated with the level of trading activity for securities. Kang, Liu and Ni [2002] noticed that on the Chinese stock market contrarian profits were related to the dominance of stock prices' overreactions to company-specific information. Chou, Wei and Chung [2007] noted that contrarian profits on the Japanese stock market were mainly related to the lead-lag effect. K.R. Foster, and A. Kharazi (2008) confirmed that contrarian strategies presented no short-term profit and were not featured on the Teheran Stock Exchange. This paper assesses the stocks at the Warsaw Stock Exchange creating contrarian portfolios. The study featured in the present article was to verify whether there existed a risk of leverage in the portfolios of contrarian companies listed on the Warsaw Stock Exchange.

2. Data and methods

The study was conducted between 2003 and 2013 on small cap stocks at the Warsaw Stock Exchange. Monthly excess returns and trading volumes, as entered into the Warsaw Stock Exchange database, were assessed. The research methodology is based on the analytical framework of Wonghotti and Pyun (2005). I used overlapping 6-year periods method which allowed for building portfolios at yearly intervals.[3] There are six 6-year study periods. Each 6-year period T consists of a three 2-year periods: *pre-formation*, *formation* and *observation*. We identify winners and losers stocks by trading volume and return characteristics during their formation periods and form three volume-based contrarian portfolios. Contrarian excess profits must generate additional risks. Two possible risks were indicated: different initial beta values found in their respective formation and observation periods and shifts in the beta values during the transition from the formation to the observation period. All three periods were taken into account when estimating the parameter. The time-

[3] Non-overlapping method regimen; the composition of the prototype portfolio remains unchanged.

varying risk of *loser* and *winner* portfolios was assessed by estimating alpha and beta parameters. A loser portfolio consisting of 24 stocks having the lowest cumulative raw return was formed from each of the three volume groups, and a winner portfolio consisting of 24 stocks in which the highest cumulative raw rates of returns were formed for each of the three trading volume group (the weights in the portfolios of shares are equal).

3. Stock identification and classification

For every 6-year period, the trading volume for the *2-year formation period* was estimated to identify and classify companies. To do so, the monthly turnover rate $TO_{i,t}TO_{i,t}$ and the market turnover rate $TO_{m,t}$ $TO_{m,t}$ were calculated as follows for every stock *i* [Wonghoti, Pyun 2005]:

$$TO_{i,t} = \frac{Number\ of\ the\ i-th\ stock\ shares\ traded\ during\ the\ month\ t}{Number\ \ of\ the\ i-th\ stock\ shares\ outstanding\ during\ the\ month\ t}$$

$$TO_{m,t} = \frac{Total\ number\ of\ the\ all\ WSE\ \ shares\ traded\ during\ the\ month\ t}{Number\ \ of\ \ all\ WSE\ stock\ shares\ outstanding\ during\ the\ month\ t}$$

The monthly averages of the turnover rate of the stock *i* - $\overline{TO}_{i,t}$ and of the market turnover rate – $\overline{TO}_{m,t}$ are 24-month arithmetic means. For each and every of the six assessed periods, the stocks were classified as one of the three following categories:

$\overline{TO}_{i,t} > \overline{TO}_{m,t}$, stock *i* belongs to the high-volume group,

$\overline{TO}_{i,t} < \overline{TO}_{m,t}$, stock *i* belongs to the low-volume group,

$\overline{TO}_{i,t} = \overline{TO}_{m,t}$, stock *i* belongs to the normal volume group.

Table 1 presents the division:

Table 1. Quantity of stocks in each trading volume group for every period on the Warsaw Stock Exchange 2003–2013

Quantity	Period	High-volume	Normal-volume	Low-volume	Total sample
1	2005–2006	21	12	74	107
2	2006–2007	27	9	91	127
3	2007–2008	40	8	99	147
4	2008–2009	46	11	111	168
5	2009–2010	45	16	137	198
6	2010–2011	63	24	122	209

Source: own research based on WSE data.

The part of *high-volume* stocks was between 19.5 and 30%, depending on the period; the part of the other stocks was as follows: *normal-volume* (5.5–11.5%) and *low-volume* (58.5–71.5%).

4. Portfolio formation time-varying

Overlapping 6-year periods allowed for assessing portfolios formed at yearly intervals, basing on the trading volume during the 2-year formation period. Monthly portfolio excess returns, calculated by subtracting the WIG benchmark excess return from the portfolio excess return, are estimated for the two two-year subsequent periods:

$$R_{P,t} = r_{p,t} - r_{m,t} R_{P,t} = r_{p,t} - r_{m,t}, \qquad t = 1, \ldots, 24.$$

An average portfolio excess return is:

$$\overline{R_{P,t}} = \frac{\sum_{t=1}^{24} R_{P,t}}{24}.$$

This allowed selecting winners and losers for the respective portfolio groups.

The cumulative average portfolio excess return for the observation period is:

$$CR_P = \sum_{t=1}^{24} \overline{R_{P,t}}.$$

A cumulative excess return of a contrarian portfolio $CR_C CR_C$ is:

$$CR_C = CR_L - CR_W CR_C = CR_L - CR_W,$$

where: $CR_L CR_L$ – cumulative average loser portfolio; CR_W CR_W – cumulative average winner portfolio.

One can speak of contrarian portfolio excess when the cumulative average loser portfolio CR_L CR_L is positive and the cumulative average winner portfolio CR_W CR_W is negative, which means *loser* portfolios are long and, at the same time, *winner* portfolios are short.

I find that the high- and low-volume contrarian portfolios were more effective than the normal trading volume contrarian portfolio.

The following charts (Figures 1 and 2) present the excess returns for the estimated portfolios.

The average of the cumulative average excess return during a 24-month period for: winner portfolio is $CR_W CR_W$ = – 29.72% and loser portfolio $CR_L CR_L$ = 77.06%. The high-volume contrarian portfolio earns an average 106.78% over the six study periods.

Figure 2 presents the analogous parameters for low-volume portfolios.

The average of the cumulative average excess return during a 24-month period for: low-volume winner portfolio is CR_W CR_W = – 25.78% and low-volume loser portfolio $CR_L CR_L$ = 58.48%. The low-volume contrarian portfolio earns an average 84.26% over the six study periods. Low-volume contrarian portfolios generated average excess returns, which was 21% less than the previous portfolio group.

Figure 3 presents the analogous parameters for normal-volume portfolios.

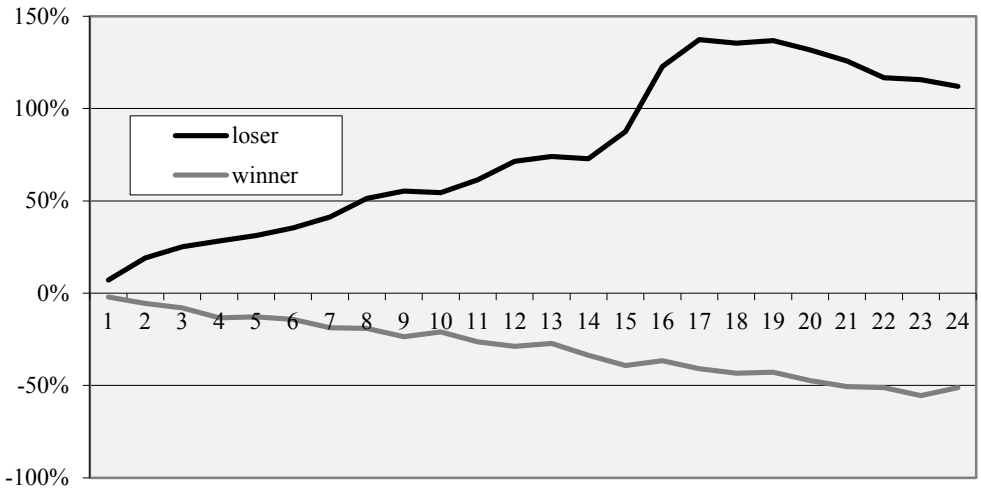

Figure 1. Cumulative average abnormal returns during the observation period (month 1 to month 24) for high-volume contrarian portfolios
Source: own study based on WSE data.

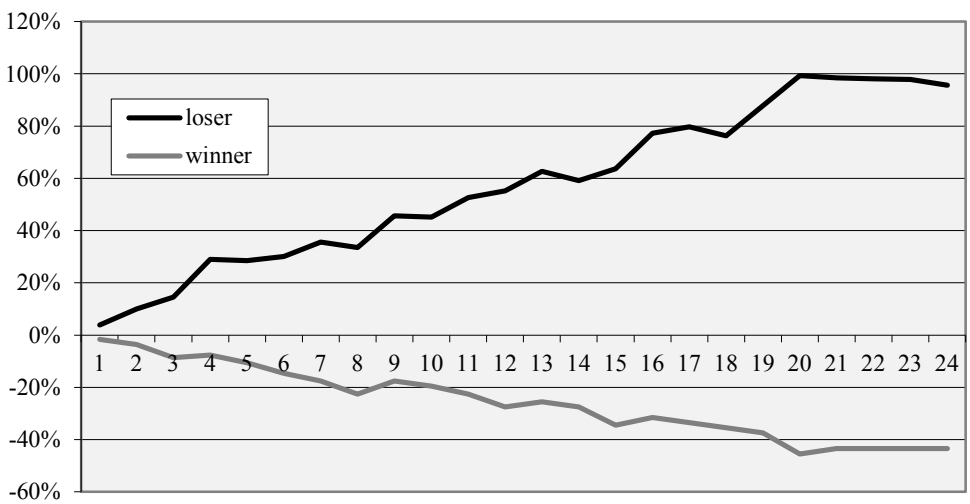

Figure 2. Cumulative average abnormal returns during the observation period (month 1 to month 24) for low-volume contrarian portfolios

Source: own study based on WSE data.

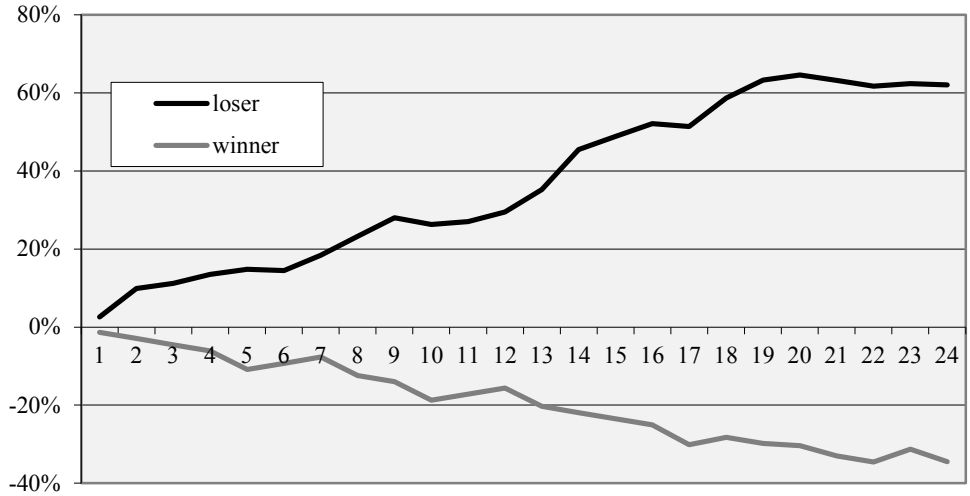

Figure 3. Cumulative average abnormal returns during the observation period (month 1 to month 24) for normal volume contrarian portfolios

Source: own study basedg on WSE data.

The average of the cumulative average excess return during a 24-month period for: normal-volume winner portfolio is CR_W CR_W = – 19.31% and normal-volume loser portfolio CR_L CR_L = 36.99%. The normal-volume contrarian portfolio earns an average 56.3% over the six study periods. Normal-volume contrarian portfolios were significantly less aggressive than the above-mentioned portfolio groups; normal-volume contrarian portfolios generated average excess returns, which was 27% less than low-volume contrarian portfolio and 50.5% less than high-volume group.

Averages of the cumulative average excess return during a 24-month period CR_WCR_W are negative: –29.72% , –25.78%, and –19.31% for high-, low-, and normal-trading winner portfolios, respectively. Averages of the cumulative average excess return during a 24-month period CR_LCR_L are positive: 77.06%, 56.48%, 36.99% for high-, low-, and normal-trading winner portfolios, respectively. It was found that the cumulative excess returns of the high- and low-volume contrarian portfolio were better than those of the normal-volume contrarian portfolio. Assuming statistical independence among six study periods at the critical significance levels of 5 and 2% (the *t*-statistics at *df* = 5 are 2.57, 3.36 for the significance level of 0.05 and 0.02, respectively).

5. Time-varying risk of contrarian portfolios

The above average excess returns of contrarian portfolios suggest an adequate risk level. The risk level of the assessed portfolios is measured with the difference between two risk types: initial – measured with beta-coefficients during the *formation period* and variable – between *two observation periods*. Regression analysis was used to estimate time-varying risk [Chan 1988; Jones 1993]:

$$R_{p,t} = \alpha_{1P}(1 - D_t) + \alpha_{2p}(D_t) + \beta_p R^e_{m,t} + \Delta\beta_{pD} R^e_{m,t} D_t + \varepsilon_{p,t},$$

where: $R_{p,t}$ $R_{p,t}$ – monthly return on the winner or loser portfolio in excess of a 1-year Treasury bill rate; $R^e_{m,t}$ – monthly return on an equally weighted WIG index in excess of the Treasury bill rate; $D_t D_t$ – variable; $D_t = 0$ $D_t = 0$ for $t = 1, \ldots, 24$; $D_t = 1 D_t = 1$ for $t = 25, \ldots, 72$; $\varepsilon_{p,t} \varepsilon_{p,t}$ – error term; $\alpha_{2W(L)} \alpha_{2W(L)}$ – coefficient (mean risk-adjusted winner (loser) portfolio); this coefficient is an estimate of the mean risk-adjusted abnormal return portfolio during the observation period; α_{2C} α_{2C} – contrarian portfolio coefficient ($\alpha_{2C} = \alpha_{2L} - \alpha_{2W}$ $\alpha_{2C} = \alpha_{2L-}$).

Tables 2, 3, 4 present the parameters for *high-volume* contrarian portfolios. If contrarian profit just compensates for leverage induced, time-varying risk, the average of estimated coefficients, $\alpha_{2C} \alpha_{2C}$, over six study periods should be insignificantly different from zero.

Table 2. Risk-adjusted high-volume loser portfolios

Period	$A_{RP,L}$ (%)	(%)	*t*-statistics	β_{2L}	*t*-statistics	β_{PL}	*t*-statistics
2003–2008	5.47	1.93	1.61	1.91	4.82	0.62	1.71
2004–2009	3.81	1.54	0.87	2.13	6.35	–0.18	–0.63
2005–2010	2.43	0.66	0.43	1.53	4.12	1.17	2.41
2006–2011	2.15	0.97	0.52	1.07	5.21	0.43	1.19
2007–2012	2.37	1.83	1.31	1.21	3.97	0.73	1.72
2008–2013	2.79	1.48	1.16	1.10	5.08	0.47	1.02
Average	3.17[(a)]	1.40	2.65	1.49	9.14	0.54	3.49

[(a)] Average *t*-statistics 1.46.

Source: own study based on WSE data.

Table 3. Analogous parameters for *high-volume* winner portfolios

Period	$AR_{P,W}$ (%)	α_{2W} (%)	*t*-statistics	β_{PW}	*t*-statistics	$\beta_{PW}D$	*t*-statistics
2003–2008	–2.13	0.47	0.82	1.34	7.26	–0.27	–1.63
2004–2009	–1.51	0.78	1.13	1.72	9.05	–0.16	–0.85
2005–2010	–1.13	0.91	1.90	1.12	8.14	–0.41	–0.21
2006–2011	–0.98	0.38	0.76	1.37	6.51	–0.53	–0.73
2007–2012	–0.81	0.66	1.14	0.83	5.12	–0.32	–0.82
2008–2013	–1.12	0.73	1.21	0.64	4.58	–0.19	–0.75
Average	–1.28[(b)]	0.66	3.41	1.17	13.21	–0.31	–2.81

[(b)] Average *t*-statistics –3.31.

Source: own study based on WSE data.

Table 4. Risk-adjusted *high-volume* contrarian portfolios

Period	$AR_{P,C}$ (%)	α_{2C} (%)	β_{PC}	$\beta_{PC}D$
2003–2008	7.60	1.46	0.57	0.89
2004–2009	5.32	0.76	0.41	–0.02
2005–2010	3.56	–0.25	0.41	1.58
2006–2011	3.13	0.59	–0.30	0.96
2007–2012	3.18	1.17	0.38	1.05
2008–2013	3.91	0.75	0.46	0.66
Average	4.45 [(c)]	0.75 [(d)]	0.32 [(e)]	0.85 [(f)]

Average *t*-statistics: [(c)] 3.16; [(d)] 2.71; [(e)] 2.19; [(f)] 2.92.

Source: own study based on WSE data.

The evaluation of high-volume contrarian portfolios reveals that a mean monthly risk-adjusted abnormal return is significantly lower than a mean monthly market-adjusted abnormal return (0.75% << 4.45%), suggesting the existence of a leverage induced risk. The mean monthly beta-coefficient for loser portfolios is equal to 1.49, and the mean monthly coefficient for winner portfolios is 1.17. The mean monthly beta-coefficient for contrarian portfolios is beta loser minus beta winner, $\beta_C = (1.49 + 0.54) – (1.17 – 0.32) = 1.18$; the average market risk premium during the observation period equals 0.75, and the adequate required excess return generated during the same period should equal $\beta(R_M – R_f)$, 1,18 × 0.75) = 0,89. As a consequence, risk premiums generated by contrarian portfolio betas (variable beta) during the

observation period and the risk-adjusted abnormal return may be explained by the abnormal return equalling α_{2C} $\alpha_{2C} + \beta(R_M - R_f)$, 0.75% + 0.89% =1.64%. In that context, the mean monthly market-adjusted abnormal return equalling 4.45% is high by 2.81% (4.45 – 1.64). The number 2.81% may represent the covariance between the beta-coefficient and the risk premium [Chan 1988].

Tables 5, 6, 7 present analogous parameters for *normal-volume* loser portfolios.

Table 5. Risk-adjusted *low-volume* loser portfolios

Period	$AR_{P,L}$ (%)	α_{2L} (%)	*t*-statistics	β_{PL}	*t*-statistics	$\beta_{PL}D$	*t*-statistics
2003–2008	4.11	1.80	1.43	1.72	7.41	0.18	0.81
2004–2009	3.07	1.35	2.11	1.47	9.12	0.47	1.42
2005–2010	2.31	0.43	0.76	0.81	6.71	0.25	1.38
2006–2011	1.73	1.24	0.87	1.03	5.34	–0.27	–0.62
2007–2012	1.61	1.11	1.32	1.24	7.62	1.21	0.73
2008–2013	1.78	1.54	2.17	1.40	5.73	0.07	0.31
Average	2.44[(a)]	1.25	0.42	1.28	10.36	0.32	2.71

[(a)] Average *t*-statistics 2.64.

Source: own study based on WSE data.

Table 6. Risk-adjusted *low-volume* winner portfolios

Period	$AR_{P,W}$ (%)	α_{2W} (%)	*t*-statistics	β_{PW}	*t*-statistics	$\beta_{PW}D$	*t*-statistics
2003–2008	–1.87	0.79	1.23	1.11	10.35	–1.17	–0.41
2004–2009	–1.24	0.37	0.51	1.29	12.14	–0.03	–0.46
2005–2010	–0.74	–0.06	–0.14	0.86	9.52	–0.19	–1.24
2006–2011	–0.69	0.32	0.63	0.94	11.37	–0.07	–0.73
2007–2012	–0.87	0.51	0.77	1.12	6.82	–0.02	–0.28
2008–2013	–1.03	0.60	1.52	1.10	8.63	–0.06	–2.31
Average	–1.07[(b)]	0.42	1.47	1.07	10.27	–0.26	–2.81

[(b)] Average *t*-statistics –1.17.

Source: own study based on WSE data.

Table 7. Risk-adjusted low-volume contrarian portfolios

Period	$AR_{P,C}$ (%)	α_{2C} (%)	β_{PC}	$\beta_{PC}D$
2003–2008	5.98	1.01	0.61	1.35
2004–2009	4.31	0.98	0.18	0.50
2005–2010	3.05	0.49	–0.05	0.44
2006–2011	2.42	0.92	0.09	–0.20
2007–2012	2.48	0.60	0.12	1.23
2008–2013	2.81	0.94	0.30	0.13
Average	3.51[(c)]	0.82[(d)]	0.21[(e)]	0.58[(f)]

Average *t*-statistics: [(c)]2.84; [(d)]1.73; [(e)]1,92; [(f)]3.11.

Source: own study based on WSE data.

For *low-volume* contrarian portfolios, the coefficient $\alpha_{2C}\alpha_{2C} = 0.82$ is higher than its analogue for *high-volume* contrarian portfolios. Analogically for *low-volume* for contrarian portfolio on obtain coefficient $\beta_C = 0.79$; adequate required excess return generated during the same period is 0.59%; variable beta during the observation period and the risk-adjusted abnormal return is 1.41; the mean monthly market-adjusted abnormal return equalling 3.51% is higher by 2.1% (3.51–1.41). Low-volume contrarian portfolios have a leverage induced risk, lower than high-volume contrarian portfolio.

Tables 8, 9, 10 present the characteristics of normal-volume loser portfolios.

Table 8. Risk-adjusted *normal-volume* loser portfolios

Period	$AR_{P,L}$ (%)	α_{2L} (%)	*t*-sta tistics	β_{PL}	*t*-sta tistics	$\beta_{PL}D$	*t*-sta tistics
2003–2008	2.48	1.10	1.82	1.53	11.34	0.05	0.12
2004–2009	2.03	1.34	2.25	1.67	12.72	0.21	1.37
2005–2010	1.52	0.29	0.62	1.27	9.56	0.09	–0.18
2006–2011	0.86	0.96	1.63	0.96	6.14	0.14	–1.26
2007–2012	1.13	0.78	1.41	0.73	7.57	0.31	0.47
2008–2013	1.19	1.27	0.93	0.56	8.45	0.23	1.17
Average	1.54[(a)]	0.96	3.38	1.12	15.22	0.17	0.74

[(a)] Average *t*-statistics 1.92.

Source: own study based on WSE data.

The values of *normal-volume* winner portfolio are presented in Table 9.

Table 9. Risk-adjusted *normal-volume* winner portfolios

Period	$AR_{P,W}$ (%)	α_{2W} (%)	*t*-statistics	β_{PW}	*t*-statistics	$\beta_{PW}D$	*t*-statistics
2003–2008	–1.39	0.62	1.31	1.24	11.72	–0.17	–0.87
2004–2009	–0.83	0.27	0.37	1.29	9.81	–0.21	–1.91
2005–2010	–0.61	0.53	0.96	0.91	12.80	–0.09	–0.62
2006–2011	–0.52	0.74	1.42	1.04	10.52	–0.13	–1.17
2007–2012	–0.74	0.42	0.81	0.87	11.24	–0.19	–1.62
2008–2013	–0.83	0.45	1.59	1.08	9.47	–0.01	–0.23
Average	–0.82[(b)]	0.51	2.71	1.07	21.47	–0.13	–2.47

[(b)] Average *t*-statistics –2.83.

Source: own study based on WSE data.

Finally for obtained values of parameters of normal-volume contrarian portfolios see Table 10.

Table 10. Risk-adjusted *normal-volume* contrarian portfolios

Period	$AR_{P,C}$ (%)	α_{2C} (%)	β_{PC}	$\beta_{PC}D$
2003–2008	3.87	0.48	0.29	0.22
2004–2009	2.86	1.07	0.38	0.42
2005–2010	2.13	–0.24	0.36	0.18
2006–2011	1.38	0.22	–0.08	0.27
2007–2012	1.87	0.36	–0.14	0.50
2008–2013	2.02	0.82	–0.52	0.24
Average	2.36[(c)]	0.45[(d)]	0.05[(e)]	0.31[(f)]

Average *t*-statistics: [(c)] 1.14; [(d)] 1.83; [(e)] 1.21; [(f)] 2.76.

Source: own study based on WSE data.

For *normal-volume* contrarian portfolios, the coefficient $\alpha_{2C} = 0.45$ is lower than its analogue for high- and low-volume contrarian portfolios. Analogically for *normal-volume* for contrarian portfolio on obtain coefficient $\beta_C = 0.26$; adequate required excess return generated during the same period is 0.59%; variable beta during the observation period and the risk-adjusted abnormal return is 0.71%; the mean monthly market-adjusted abnormal return equalling 2.36% is higher by 1.65% (2.36 – 0.71). Low-volume contrarian portfolios have a leverage induced risk, lower than high- and low-volume contrarian portfolio.

6. Conclusions

During the observation period contrarian portfolios presented an excess return of 2.36%. It mostly resulted from a very high upward trend at the Stock Exchange between 2006 and 2007, followed by a downward trend indirectly resulting from the subprime mortgage crisis. For all contrarian portfolios, the mean monthly excess return is lower than the monthly market-adjusted return, this way all portfolios have leverage induced risk. The highest value of beta coefficient has *high-volume* contrarian portfolio and the smallest value of beta coefficient characterised *normal-volume* contrarian portfolio. These results are adequate to rates of return of portfolios.

References

Balvers R., Wu Y., Gilliland, E., 2000, *Mean Reversion across National Stock Markets and Parametric Contrarian Investment Strategies*, The Journal of Finance, vol. 55, p. 745–772. doi: 10.1111/0022-1082.00225

Campbell J.Y., Hentschel L., 1992, *No news is good news: An asymmetric model of changing volatility in stock returns*, Journal of Financial Economics, vol. 31, no. 3, p. 281-318.

Chan K.C., 1988, *On the Contrarian Investment Strategy*, Journal of Business, vol. 61, no. 2, p. 147–163.

Chan K.C., Chen N.-F., 1988, *An Unconditional Asset-Pricing Test and the Role of Firm Size as an Instrumental Variable for Risk*, The Journal of Finance, vol. 43, p. 309–325. doi: 10.1111/j.1540-6261.1988.tb03941.x.

Chou P.-H., Wei K.C.J., Chung H., 2007, *Sources of Contrarian Profits in the Japanese Stock Market*, Journal of Empirical Finance, vol. 14, no. 1, p. 261–286.

Fama E.F., French K.R., 1992, *The Cross-Section of Expected Stock Returns*, The Journal of Finance, vol. 47, p. 427–465. doi: 10.1111/j.1540-6261.1992.tb04398.x.

Fama E.F., Schwert G.E., 1977, *Asset Returns and Inflation*, Journal of Financial Economics, vol. 5, p. 115-146.

French K., Schwert G.W., Stambaugh R.F., 1987, *Expected Stocks Returns and Volatility*, Journal of Financial Economics, vol. 19, no. 1, p. 3–29.

Hameed A.,Ting S., 2000, *Trading Volume and Short-horizon Contrarian Profits: Evidence from Malaysian Market*, Pacific-Basin Finance Journal, vol 8, no. 1, p 67–84.

Jones S.L., 1993, *Another look at time-varying risk and return in a long-horizon contrarian strategy*, Journal of Financial Economics, vol. 33, issue 1, p. 119-144.

Kang J., Liu M.-H., Ni S.X., 2002, *Contrarian and Momentum Strategies in the China Stock Market: 1993–2000*, Pacific-Basin Finance Journal, vol. 10, no. 3, p. 243–265.

Lakonishok J., Shleifer A., Vishny, R.W., 1994, *Contrarian Investment, Extrapolation, and Risk*, The Journal of Finance, vol. 49, p. 1541–1578. doi: 10.1111/j.1540-6261.1994.tb04772.x.

Mun J.C., Vasconcellos G.M., Kish R., 1999, *Tests of the Contrarian Investment Strategy Evidence from the French and German Stock Market*, International Review of Financial Analysis, vol. 8, no. 3, p. 215–234.

Nam K., Pyun C.S., Avard S., 2001, *Asymmetric Reverting Behavior of Short-Horizon Stock Returns: An Evidence of Stock Market Overreaction*, Journal of Banking and Finance, vol. 25, p. 807-824.

La Porta R., 1996, *Expectations and the Cross-Section of Stock Returns*, The Journal of Finance, vol. 51, p. 1715–1742. doi: 10.1111/j.1540-6261.1996.tb05223.x.

La Porta R., Lakonishok J., Shleifer A., Vishny R., 1997, *Good News for Value Stocks: Further Evidence on Market Efficiency*, The Journal of Finance, vol. 52, p. 859–874. doi: 10.1111/j.1540-6261.1997.tb04825.x.

Tkac A.P., 1999, *A Trading Volume Benchmark: Theory and Evidence*, Journal of Financial and Quantitative Analysis, vol. 34, no. 1, p. 89–114.

Wongchoti U., Pyun C.S., 2005, *Risk-adjusted Long-term Contrarian Profits: Evidence from Non-S&P 500 High Volume Stocks*, Financial Review, vol. 40, no. 3.

RYZYKO STRATEGII *CONTRARIAN* NA GPW W WARSZAWIE

Streszczenie: W pracy opisano wyniki badania ryzyka strategii *contrarian* na GPW w Warszawie w latach 2003–2013. Stosując metodę *overlapping* dla sześcioletnich okresów, skonstruowano elastyczne portfele. Zmiany wartości współczynników beta pozwoliły oszacować ryzyko strategii *contrarian*.

Słowa kluczowe: rynek kapitałowy, giełda, ryzyko, strategie inwestycyjne.