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## Article

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## Low Price Anomaly in M&A Transactions<sup>1</sup>

Radosław PASTUSIAK – Magdalena JASINIAK – Anna PLUSKOTA\*

### Abstract

*Low price anomaly describes the phenomenon in which low-priced stocks grow faster than high-priced stocks and generate higher rates of return. The aim of this article is to verify the existence of low price anomaly on the example of mergers and acquisitions of European companies. The authors' proposal was to analyze this phenomenon in case of stocks up to 1 euro and above 100 euro. Authors proved that rate of returns differ according to price what corresponds to the literature. The study shows that in case of M&A it is more likely that the investors will gain when purchasing stocks of overtaking companies valued up to 1 euro, than those valued above 100 euro. Investments in low-priced stocks are more likely to generate higher profits than investments in high-priced stocks, however, they are also characterized by higher risk.*

**Keywords:** *low price anomaly, nominal stock prices, low-priced stocks, mergers and acquisitions, binary logit model*

**JEL Classification:** G11, G34, G41

### Introduction

The investment processes and their efficiency are determined not only by strictly economic factors but also on psychological aspects. Final investment decisions are strongly affected by human emotions and risk tolerance.

Assuming that investors behave rationally in the investment processes, all possible choices should be analyzed and ranked according to their importance what leads to final decision that maximize the subjective expected utility.

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<sup>1</sup> Following article has not been previously published and simultaneously submitted for publication elsewhere.

However, due to certain limitations of time and in limited access to information, investors avoid rational methods and use faster and simpler procedures. Additionally, they are influenced by behavioral biases which sometimes cause irrational and contradictory decisions. One of factors that influence the investment decision is stock price perception. On the capital market, it has already been shown that rates of return may be different depending on the share price. It states in contrast with effective market hypothesis. Scholars have been studying many anomalies reflecting investors' perception of stock value (f.e. Rossi, Della Peruta and Mihai Yiannaki, 2016; Zaremba, 2016; Huang, Shieh and Kao, 2016; Chan, Frankel and Kothari, 2004). The results of the study are not clear and show not only the lack of investors' reactions to attractive, low-priced stocks (e.g. in the case of splits), but also the opposite phenomena – where expensive stocks generated higher returns than low-priced stocks. The problem is also reflected in price perception in the context of price endings and one digit prices that influence investors' decisions. However, these studies do not focus on mergers and acquisitions while this market is very large – in terms of number of transactions and its volume that is why the success of these transactions is of great economic importance.

Following research concentrates on mergers and acquisitions. As far as the authors are aware, no one verified price perception and low price anomaly according to these specific transactions. Limitation of the research to a selected group of transactions is a new approach in this field.

Mergers and acquisitions are important events that influence the business process and international trade and they always lead to investors' reactions. The main reason of these transactions is to drive economic growth, diversify the activity risk, tax benefits, profile and economies of scale. Mergers and acquisition in international markets are usually more frequent under good economic conditions to provide new technological opportunities, to enhance an enterprise's trademark, to achieve a variety of synergy effects, economies of scale and management, improve allocation of resources and market power gains (Garskaite-Milvydiene and Burksaitiene, 2016).

Deepening research in this area is important and provides better understanding of these transactions, investors' expectations and as a consequence it might influence the investors' interest in particular transactions and their effectiveness. The increase in demand for specific groups of stocks will be one of the factors driving up their prices and will increase the likelihood of an above-average return. Expending the knowledge about investors' behavior and price perception in case of M&A transactions is a value for bidding strategies and their success.

The aim of this article is to verify the existence of low price anomaly on the example of mergers and acquisitions of European companies. Authors choose the Central Europe countries (Bulgaria, Czech Republic, Croatia, Hungary, Lithuania, Latvia, Poland, Russia, and Slovenia) as emerging markets with increasing investment attractiveness and growing volume of M&A transactions. According to the authors' belief, such an elaboration of the study may lead to a better understanding of the investigated phenomenon and it is an important contribution to science.

The study covers the period from 2005 to 2015 and pertains to the analysis of mergers and acquisitions of joint stock companies. A relation of stocks of the companies subject to mergers or acquisitions during analysed the period were examined. Only those transactions in which companies had capital from central Europe were selected. Data are selected from Zephyr database.

The authors verify the hypothesis that in the case of low-priced stocks (up to 1 euro), the chances of price increase are higher than in the case of high-priced stocks (above 100 euro).<sup>2</sup> The hypothesis is based on the analysis of literature and refers to the low price anomaly. However, the authors' proposal is to refer to a specific price range reflecting low-priced and high-priced stocks. Data of companies from Central Europe were chosen due to the lack of similar literature analyzes.

The study includes statistical and econometric analyses. Based on statistical analysis, the authors have detected differences in rates of return for two price groups: low (up to 1 euro) and high (over 100 euro). The tests for differences between the average to confirm the statistical significance of the differences have been used.

The authors also used the Shapiro-Wilk's test to test the normal distribution and Kolmogorow-Smirnow's test and Mann-Whitney's test for the test of average equability. The logit model also confirmed that the probability of a greater return is higher for stock prices below 1 euro.

The structure of the article takes into account theoretical considerations in the field of heuristics affecting investment decisions and price perceptions by investors, in particular price clustering and price rounding. The results of research on the low price anomaly and the importance of stock split in investment decisions of stock market investors are presented. The methodology study was then discussed and conclusions were drawn. The study concludes the discussion on the results and the direction of further research.

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<sup>2</sup> The concept of low price has not been clearly defined in the literature. Zaremba et al. (2016), studied case of Polish market. Authors ranked stocks and obtained five subgroups based on 20th, 40th, 60th and 80th percentiles. In following article, we propose different approach and proposed two breakpoints of nominal stock prices: 1 and 100 euro.

## 1. Stock Price and Investment Decisions

The psychological aspects of the process of making a judgment by the people are fundamental to the decisions being made. It is worth recalling the theory of Kahneman and Tversky (1979) and its main assumption: while assessing whether something is positive or not, the decision-maker assumes some point of reference. This applies to the heuristics of anchoring and customization, e.g. a simplified method of inference that relies on (anchors the mind) the selected information and then interpret other data with respect to it.

The selected marketing offer is compared to the indicated point (anchoring) and considered in terms of potential profit or loss. From the view of theory of perspective, it is clear that losses are overrated in comparison to profits – loss brings more sadness than profit brings joy. For example, at a reduced – lower unit stock price, the potential loss seems to be lower (despite the purchase of multiple stocks, the cost per stock may seem smaller, because it is considered separately for individual stocks).

In the case of a successful investment, a different evaluation process may be launched to enhance the decision-maker's well-being. It is one of the Thalers' (1985; 1999; 2008) four mental calculations (mental accounting), which he derived from the theory of perspective of Kahneman and Tversky. One of them is the principle of distributing profits: the buyer gets more satisfaction from several smaller profits than from one larger, which is the sum of the smaller ones. The importance of price perception, widely explored and used in the market of consumer goods, also seems to be important in the capital market.

Perception of the price as a high generally discourages the purchase. People are sensitive to price especially when they have to spend more. Psychology has already documented several anomalies related to human perception and simplification of the information contained in the figures. There are known phenomena like the effect of left-hand numbers (ex. Kraus and Kroenke, 2011; Thomas and Morowitz, 2005) or round figures, which cause discontinuity on the market demand side (Lacetera, Pope and Sydnor, 2012). Research on this matter has been conducted and the results have shown that stock market investors are subject to certain behavioral crashes that affect price perception and investment decisions (e.g. anchoring, rounding, price clustering). As Cronqvist, Siegel and Yu (2015) observed, behavioral biases strongly influence individual investors' style.

Low price anomaly describes situation when low-priced stocks grow faster than high-priced stocks. This research area is relatively unexplored, especially in terms of mergers and acquisitions. According to Fama and French (1992), predicting the future on the financial markets is important due to the human attachment to money and the utility value of financial instruments. The dilemma

of the investor is to make a decision about investment directions in such a way that the investment will bring the required rate of return at a given level of risk.

Fritzemeier (1936) was the first who described low price anomaly on the example of industrial companies listed on the New York Stock Exchange market. Author classified companies according to price, describing those with price below 10 USD as the low-priced stocks and stocks above 100 USD as high-priced stocks. Study confirms that low-priced stocks grow much faster than the expensive ones and their value decrease relatively slow. Bhardwaj and Brooks (1992) also proved that low price anomaly exists. Similar to previous studies, the authors also categorized stocks by certain price groups where low-priced stock were defined as those with price up to 5 USD. Additionally, the low price anomaly was verified in the context of other calendar anomalies. It was concluded that January effect illustrated by seasonal increase in stock prices is in fact caused by low-priced stocks. Hwang and Lu (2008) concluded that stock price significantly influence the rates of return. Stocks with price less than or equal to 5 USD generate on average higher rates than stocks with prices above 20 USD. According to the authors, the strategy of buying low-priced stocks may generate above – average rates of return independently of other parameters such as company size, liquidity, book to market value, profit per share and previously realized projects. Similar to Bhardwaj and Brooks, the authors also confirmed that January effect is exacerbated by low-priced stocks.

Waelkens and Ward (1997) neglected the low price anomaly on Johannesburg market, however, the authors focused only on industry sector. It was concluded that the anomaly is inverted – the excessive rates of return were observed in group of most expensive stocks (selected by quantiles). Zaremba et al. (2016) were the first researchers who studied the case of Polish Stock Exchange market in the context of low price anomaly. Authors have also concluded that this anomaly is inverted. The authors hypothesize that low price anomaly is country – specific and in some countries may prevail while in others might be related (according to Kumar, 2009) with lottery stocks that are characterized by low prices, high variances, positively skewed returns and underperformance.

Marsat and Williams (2013) proved that price is relevant in estimating fundamental value whatever it is actual or manipulated price. Study confirmed that price is a convenient anchor in the absence of an objective value.

Research has repeatedly pointed out to the phenomenon of price clustering on the capital market. Neiderhofer (1965; 1966); Neiderhoffer and Osborne (1966); Harris (1991) and others have proved that stocks with price ending with an integer or a half were more popular than those ending with quarters or eighths. Ball, Torous and Tschoegl (1985) demonstrated the existence of a price-clustering

phenomenon on the London gold market. Goodhart and Currio (1990) showed on the example of foreign exchange markets the phenomenon of decimal price clustering.

According to Harris (1991) and Grossman et al. (1997), the phenomenon of price clustering reflects the classified agreements during price negotiations, which accelerates and simplifies them. The theory of Christie and Schultz (1994), developed by other authors, (i.a. Godek, 1996; Kandel and Marx, 1997), refers to the use of price clustering as a means of maintaining a wider bid – ask spreads than would prevail under full competition. The authors explain that by grouping prices by rounding them simplifies negotiations and illustrates pricing strategies for buyers. On the other hand, Kahn, Pennacchi and Sopranzetti (1999) indicate that sellers use the memory-economizing advantage of investors who tend to cut the observed prices rather than memorize their full value or round off the price and then remember it. Such behavior is also observed in other markets.

Kandel, Sarig and Wohl (2001) have shown that, on the capital market, IPO investors prefer round prices. According to the authors, the demand for stocks is conditioned by the last digit of share price. For prices ending in 0 and 5, the demand for stocks is relatively higher and with prices ending with 0 are used more often than prices ending with 5. Investors participating in IPO transactions tend to use higher prices. In the case of an IPO, pricing strategies or agreements cannot be negotiated to reduce transaction costs, thus the authors explain this phenomenon as the inclination of investors to use round prices more frequently. Bhattacharya, Holden and Jacobsen (2012) also observed that stock traders focus on round numbers as cognitive points for value. According to Sonnemans (2006), stock prices have tendency to cluster at round numbers finished with 0 and to a lesser extend with 5.

Hwang and Lu (2008) have shown that the stock price is significant and inversely proportional to the rates of return. Penny stocks with a price lower than or equal to 5 USD achieve higher returns on average than expensive stocks (over 20 USD). The authors suggest that a low price strategy may yield above-average rates of return – 53 basis points a month within analyzed period. Profitability of this pricing strategy does not end in a 2-year period, even after taking into account transaction costs. Profitability of this strategy is maintained regardless of other parameters such as size, liquidity, book-to-market equity, earning/price ratio and past performance. However, Pandey and Sehgal (2016) observed that penny stocks negatively affect size effect in case of Indian Stock Exchange Market.

Price illusion is also one of the hypotheses justifying the splits. Brennan and Copeland (1988) and Ikenberry, Rankine and Stice (1996) explain that managers split stocks despite increasing brokerage commissions, signaling that the company

is in a good shape and that they are convinced of its profitability and ability to generate positive cash flows in the future. In that case, low-priced stocks signal good company's perspectives. The optimal – range hypothesis indicates that the division of stocks is aimed at attracting attention and acquiring smaller shareholders.

This is one of the most common explanations of the splits (i.e., Lamoureux and Poon, 1987; Amihud and Mendelson, 1988; Mukherji, Kim and Walker, 1997). Another explanation for dividing stocks is the increase of their liquidity: low nominal price stocks are more accessible, especially for minor investors. When there are many investors willing to buy low-priced stocks, liquidity is expected to increase (Baker and Gallagher, 1980; Muscarella and Vetsuypens, 1996; Schultz, 2000 among others).

In the literature, there are some discussions confirming that the investors are influenced by nominal stock prices and explaining this phenomena by nominal price illusion. Hwang and Lu (2008) explain that if there are two assets with the same characteristics but of significantly different nominal price, the same rate of return causes that stock price increase is greater in case of stocks with higher nominal price.

In this situation investors perceived high-priced stocks as too expensive to grow and naively expect that low-priced stocks will rise at a faster rate. In this perspective, if managers are aware of the preferences of investors, they will maintain low share prices to maximize their value. This is also confirmed by Green and Hwang (2009) who indicate that in investors' perception low-priced stocks are close to zero and have "plenty space to grow" while high-priced stocks do not have higher upside potential. Similar conclusions are proposed by Baker, Greenwood and Wurgler (2009) who state that investors suffer from nominal price illusion and are convinced that low-priced stocks have high potential to grow and at the same time there is not much to lose.

On the other hand, stocks with high-prices may be prestigious because only small group of investors with wealthier portfolios can afford to buy them. In that context, the value of stocks subjectively increase by the behavioural factors (Fernando, Krishnamurthy and Spindt, 1999).

The way how market perceives stock prices force managers to maintain stock prices at level currently expected by investors and partly explains existence of low price anomaly on the capital market.

The above conclusions support the arguments of irrationality of the decision maker who abandons mathematical calculations and uses heuristics or unreliable assessment strategies. He does this to simplify and shorten the decision-making process or to feel better after choosing a supposedly better option.



Unfortunately none of described studies analyzed the particular case of mergers and acquisitions transactions. To the authors' knowledge, this is the first study that analyzes the matter of stock price on M&A transactions example.

## **2. M&A Transactions – Their Motives and Effectiveness**

M&A transactions are part of companies' internal strategy for enhancing its value and are also important in terms of increasing volatility on the capital market (Jansen, 2004). This is one of possible external ways to achieve growth opportunities to the companies (Jayesh, 2012) by the attempt of the buyer to secure control of the target company and implement a new strategy that would bring the effect of increasing the value of both companies (Kumar and Paneerselvam, 2009). Benoit, Xavier and Alain (2010) indicate that one of primary purposes of M&A transactions is share prices improvement.

The price that is offered by bidding companies for a target is usually an outcome of negotiations with the target's board of management. The price offer is estimated by increased company value (under new company structure) and after cost reductions (labour, equipment), including new capital structure, new market power, improved management and many other economic factors (Lang, Stulz, and Walkling, 1989; Jovanovic and Rousseau, 2002). However Baker, Pan and Wurgler (2012) indicate that in practice valuing company is subjective and reflects other influences such as psychological factors that have an impact on the board of target and bidder and target shareholders.

Profitability of M&A transactions is a subject of many studies, however still it is not clearly known on what circumstances these transactions provide benefits. In addition, as noticed by Zaremba and Płotnicki (2014), majority of studies are focused on developed markets (US, Western European countries) while examination of emerging markets, including Central and Eastern Europe is limited. Analyzing various research approaches, Bruner (2001) concluded that on balance these transactions bring profits but not to all.

Processes of M&A transactions directly affect the stock prices of both – bidder and the target (Shah and Arora, 2014). The impact of M&A transactions might be positive or negative on shareholders' wealth. According to Soongswang (2011), Chavaltanpipat, Kholdy and Sohrabian (1999) positive impact after announcement is observed in case of target firms but not for the acquirer. Guest, Bild and Runsten (2010) describe opposite effects – the share returns are negative after acquisition of the target company. The same results were found in the case of UK transactions explored by Cummis and Weiss (2004). Zaremba and Płotnicki (2014) proved that positive and significant abnormal returns on acquiring

and target companies occur in the first weeks following transaction announcement in case of CEE stocks markets. Officer, Poulsen and Stegemoller (2009) focused on transactions on companies with high and R&D intensity and concluded that acquirers achieve higher returns in that case.

Analyzing the correlation between the share price and M&A transactions, from the buyer's perspective, it is expected to observe higher activity in the market when share prices are low in order to generate long – term success (Eisenbarth and Meckl, 2014). Providing knowledge how investors' perceive stock prices in M&A transactions is another key to bidding strategies. The M&A market contains large number of transactions at high values, thus the success of these transactions is of great economic importance.

Hukkanen and Keloharju (2015) noticed that initial price offer per share in M&A transactions are usually expressed at coarse terms. According to provided studies, it is observed that initial bids are clustered at round numbers and bids that last digit is 5 and 0 are more common than others. The authors proved that there is a relation between price offer and M&A outcomes – a round price offer is associated with higher price paid for the target shares and lower probability for the initial bidder completing the deal. Additionally, it is also confirmed that bids placed at about five dollar or half a dollar are significantly more likely to generate competing bids than bids greater than one quarter. This suggest that presented price do matter for the investors and provide certain information to the market.

### 3. Data and Methodology

The study is aimed at verifying whether higher returns are achieved on transactions with low-priced stocks or on transactions with high-priced stocks. Then, statistics on rates of return and price differences for group housing were analyzed. Significance of differences in values between these groups was determined by Kolmogorow-Smirnow and Mann-Whitney test. The study completes the analysis of the logit model.

The empirical study was conducted on the basis of mergers and acquisitions transactions in Poland from 2005 to 2015. Only those transactions in which companies had capital from Central Europe were selected thus database consist of 764 M&A transactions. Authors choose the Central Europe countries (Bulgaria, Czech Republic, Croatia, Hungary, Lithuania, Latvia, Poland, Russia, and Slovenia) as emerging markets with increasing investment attractiveness and growing volume of M&A transactions.

Descriptive statistics for the entire sample are shown in Table 1.

Table 1

**Descriptive Statistics for the Entire Sample**

	Share price for 3 months before the merger	Price after the merger	Rate of return	Price difference
Average	14.47291	13.35641	0.314001	-1.1165
Standard error	3.042551	3.068515	0.091608	1.160091
Median	0.945826	1.028586	0.008513	0.002609
Standard deviation	84.09778	84.81545	2.532099	32.06556
Slant	14.61479	18.35951	14.98435	-16.4659
Variance	7 072.437	7 193.661	6.411528	1 028.2
Minimum	0.002379	0.002297	-0.99828	-727.631
Maximum	1 750	1 985.23	48.07767	235.23

Source: Own research based on data derived from Zephyr database.

Finally, a total of 412 transactions were included in the study, out of which 391 concern companies acquired 3 months before the merger with stock prices up to 1 euro and 21 transactions with stock prices above 100 euro. Both subsample represent 54% of the entire data set. Prices up to 1 euro represent 51% of the entire data and prices above 100 euro represent 3% of the entire data.

We may here formulate first conclusion that in case of M&A transaction the positive skewness of stock prices is observed what confirms the observations in the up to date studies. In case of Central European capital markets, investors probably are more likely to buy stocks at relatively low prices expecting growth in the near future. According to value of variance that has also been analyzed, second conclusion is that a variance for prices up to 1 euro is much higher, which means greater dispersion of results and higher risk.

The database was sorted by stock price from the lowest to the highest in 3 months before the merger. The analyzed groups should be of equal number of observations, thus from the group of 391 low-priced observations, 21 cases were drawn randomly. Finally, the authors used 21 observations for low transaction prices and 21 observations for high transaction prices.

On the one hand, the number of transactions seems to be relatively low, but on the other hand, it contains 100% transactions of stocks with the highest prices.

#### 4. Research Methods and Statistical Analyzes

A statistical analysis was conducted on the gathered data. In order to capture differences in statistics between groups of stock prices up to 1 euro and above 100 euro, descriptive statistics were calculated separately for both groups (Tables 2 and 3). The average return on the share price up to 1 euro was 20.19% and the average price difference was 0.02 euro. These statistics for the group of stock prices above 100 euro are much less favorable as the average return is

–11.21% and the average price difference is –52.53 euro. It should be noted that the standard deviation for rates of return in Table 2 is 0.66 and in Table 3 is significantly lower than 0.37. This shows a much lower average spread of rates for the group of high-priced stocks. For price differences, the standard deviation is much lower for low-priced stocks because they are less valuable – up to 1 euro. Descriptive statistics indicate that on average the higher profits of the stocks of the acquired companies were achieved for the stock prices up to 1 euro.

Table 2

**Descriptive Statistics for Prices Up to 1 Euro**

	Share price for 3 months before the merger	Price after the merger	Rate of return	Price difference
Average	0.1667	0.1855	0.2019	0.0189
Standard error	0.0298	0.0331	0.1506	0.0143
Median	0.1174	0.1638	0.0198	0.0031
Standard deviation	0.1366	0.1518	0.6900	0.0653
Slant	0.57639	13.92974	10.94413	15.77064
Variance	0.083817	1.002164	12.192	0.886922
Minimum	0.0215	0.0056	–0.7504	–0.1101
Maximum	0.3813	0.4770	2.1603	0.2020

Source: Own research based on data derived from Zephyr database.

Table 3

**Descriptive Statistics for Prices over 100 Euro**

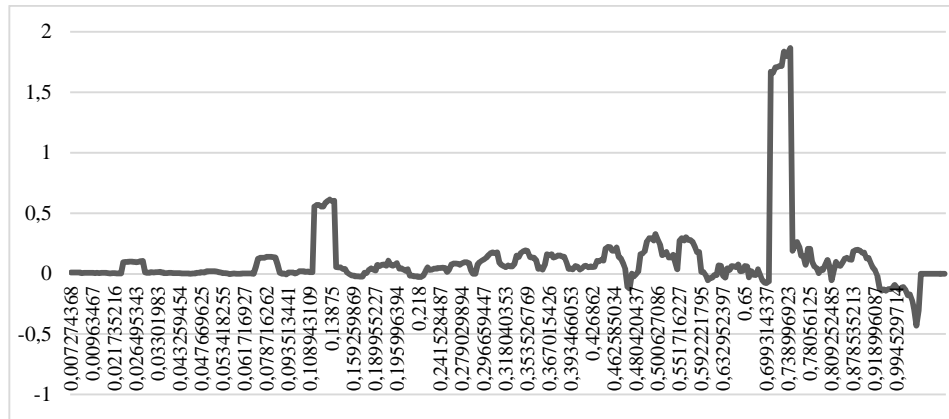
	Share price for 3 months before the merger	Price after the merger	Rate of return	Price difference
Average	339.4141	286.8810	–0.1121	–52.5331
Standard error	84.3381	94.0100	0.0819	40.9466
Median	184.5548	175.9658	–0.0235	–2.3835
Standard deviation	386.4857	430.8078	0.3755	187.6407
Slant	2.852335	3.484833	–1.01701	–2.52755
Variance	149 371.2	185 595.3	0.141012	35 209.04
Minimum	101.4546	0.5918	–0.9983	–727.6311
Maximum	1 750.0000	1 985.2300	0.4792	235.2300

Source: Own research based on data derived from Zephyr database.

In both analyzed groups calculated what the percentage of records for price stock 3 months prior to the merger was lower than the stock price after the acquisition. For a group of low-priced stocks this ratio was 52.6% (206 records with a positive difference compared to 391 observations). For the second group of high-priced stocks this ratio amounted to 38% (8 observations with a positive price difference compared to 21 observations).

Figures 1 and 2 show graph of a moving average with even periods of 10 from the difference in prices between 3 months before the merger and the moment of finishing the transaction.

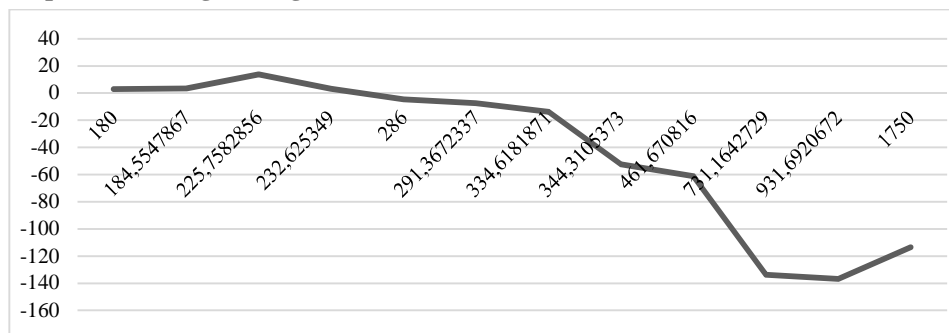
Figure 1

**10-period Moving Average with Differences for Prices Up to 1 Euro**

Source: Own research based on data derived from Zephyr database.

Figures also show statistically more frequent price increases for low-priced stocks, and therefore the probability of profit per share is higher. This is particularly noticeable for prices from about 0.10 euro to 0.90 euro, where the average clearly indicates a positive average difference in prices across 10 neighboring records. It may suggest that low price anomaly occurs in strictly defined price range. Stocks prices below 0.10 euro might be perceived as too cheap to buy. Investors may associate stocks with very low prices as very risky, not valuable and not prestigious thus they may avoid them.

Figure 2

**10-period Moving Average with Differences for Prices above 100 Euro**

Source: Own research based on data derived from Zephyr database.

In order to check the differences in the mean between the two analyzed groups, the database was sorted from the cheapest share to the most expensive one in the period of 3 months before the transaction. The authors used 21 observations

for low transaction prices (5.4% of total low-priced stocks sample) and 21 observations for high transaction prices (100% of total high-priced stocks sample). Shapiro-Wilk's test ( $\alpha = 0.05$ ) was performed on a randomized trial. Shapiro-Wilk's test indicates that in the case of returns in a group of low-priced stocks, the distribution is a normal distribution. The group of returns of high-priced stocks and the sample concerning differences were characterized by a non-normal distribution.

Therefore, nonparametric tests were used to analyze differences between the two means.

Table 4

**Test Results of Shapiro-Wilk's Normal Distribution**

		Statistics	Significance
Rates of return	0	0.786	0.000
	1	0.899	0.034
Differences	0	0.909	0.052
	1	0.711	0.000

Source: Own research based on data derived from Zephyr database.

Kolmogorov-Smirnov's and Mann-Whitney's non-parametric tests were conducted to verify whether the differences between those two groups of rates of return and the two groups of price differences were statistically significant ( $\alpha = 0.05$ ). Table 5a shows the values of the statistics obtained once with the significance of the test. The value of asymptotic significance for rates of return indicates that there are no statistically significant differences between the rates of return for low-priced stocks and the rates of return for high-priced stocks. The tests for price differences clearly indicate differences in the mean. It should be noted that the differences in prices for low-priced and high-priced stocks are significantly different. Thus, by investing in a group of low-priced stocks, it is possible to achieve on average higher returns than investing in a group of high-priced stocks. The authors also repeated the draw on two other samples, however, identical results and conclusions were obtained. The results of the tests on two additional samples are shown in table 5b and 5c.

Table 5a

**Test Results Verifying Equality of Means in 2 Independent Groups – First Draw**

	Rate of return	Differences
According to Kolmogorov-Smirnov	0.772	1.852
Asymptotic significance	0.591	0.002
According to Mann-Whitney	-1.245	-1.119
Asymptotic significance	0.213	0.263

Source: Own research based on data derived from Zephyr database.

Table 5b

**Test Results Verifying Equality of Means in 2 Independent Groups – Second Draw**

	Rate of return	Differences
According to Kolmogorow-Smirnow	0.617	1.852
Asymptotic significance	0.841	0.002
According to Mann-Whitney	-0.164	-1.019
Asymptotic significance	0.870	0.308

Source: Own research based on data derived from Zephyr database.

Table 5c

**Test Results Verifying Equality of Means in 2 Independent Groups – Third Draw**

	Rate of return	Differences
According to Kolmogorow-Smirnow	0.617	1.852
Asymptotic significance	0.841	0.002
According to Mann-Whitney	-0.717	-0.968
Asymptotic significance	0.473	0.333

Source: Own research based on data derived from Zephyr database.

The study was further extended with a built-in logit model to explain the probability of hitting a share price above 100 euro having only a variable explaining the rate of return. The model was built using 412 observations. The variable explaining it is a binary variable with a value of 0 for stock price returns up to 1 euro and for returns above 100 euro the binary variable with a value of 1 (variable  $Z_i$ ). The function linking the probability  $p_i$  with variable rate of return is as follows:

$$p_i = \frac{\exp(\alpha_0 + \alpha_1 \text{rate of return}_i)}{1 + \exp(\alpha_0 + \alpha_1 \text{rate of return}_i)}$$

where  $\exp(F) = e^F$ .

Thus the estimated econometric model has the following form:

$$Z_i = \alpha_0 + \alpha_1 \text{rate of return}_i$$

Table 6

**Logit Model for the Binary Variable  $Z_i$** 

	Coefficient	Standard error	z	Value p	
const	-2.88774	0.232632	-12.4134	<0.0001	***
Rate of return	-1.21878	0.558013	-2.1841	0.0290	**
Arithmetic mean of the dependent variable	0.050971		Standard deviation of dependent variable	0.220206	
McFadden R2	0.041704		Corrected R2	0.017596	
Logical credibility	-79.50218		Kryt. inform. Akaike'a	163.0044	
Bayes. Schwarz criteria	171.0464		Hannan-Quinn criteria	166.1854	
f(beta'x) To medium independent variables = 0.220					
Test of reliability: Chi-square (1) = 6.91963 [0.0085]					

Source: Own research conducted in GRETL program.

The measure of model fit is the McFadden R-square, which is 0.04. The low R-squared value is typical for dichotomous models. The test of reliability indicates that the model is statistically significant (p-value is less than 0.05). The negative value of the coefficient at the variable rate of return means that the variable with the explanatory variable  $Z_i$  has the direction of inverse relation. Once the rate of return increases, the probability that the stocks are above 100 euro decreases. Simulation of the probability of obtaining stock prices above 100 euro for the return value was also performed, as shown in Table 7.

Table 7

**Probability that the Rate of Return Belongs to Stock Prices above 100 Euro**

Rate of return	Probability
1	0.0162
0.5	0.0293
0.1	0.0469
-0.1	0.0591
-0.5	0.0929
-1	0.1585

Source: Own research.

The above study is an attempt to investigate the research problem indicating at the beginning. The study was conducted among defined transactions – mergers and acquisitions and provides new conclusions in this area in the context of low price anomaly.

## 5. Results and Discussion

The results of the study confirm the occurrence of low price anomaly on the example of Central European countries. This verification was based on the example of M&A transactions in 2005 – 2015 that took place in Central Europe. Until now, the occurrence of low price anomaly on the example of M&A transactions on these markets has not been verified.

M&A transactions were dealt with in a similar way by Hukkanen and Kelo-harju (2015) who proved the relationship between the offered price and the results of mergers and acquisitions, which is similar to the conclusions made on the basis of the research conducted above.

At the beginning of the study, a research hypothesis was put forward that in the case of low price stocks (less than 1 euro) there is a greater chance of achieving a price increase than in the case of high-priced stocks (more than 100 euros). The research allowed correct verification of the hypothesis and it should be concluded that investments in the so-called cheap stocks are associated on average with higher profits than investments in expensive shares. This is important information from



the investor's point of view, because in the case of mergers and acquisitions, he should pay attention to shares worth up to 1 euro. Obviously, investing without a deeper analysis in a company with a low face value will not always guarantee profit, however there is a higher probability of profit than in the case of expensive shares. This narrowing of the investment area will already result in lower costs of the analysis, but most importantly, the investments within the scope of cheap shares with a higher probability will give higher rates of return.

## **Conclusion**

Statistical and econometric analyses indicate that the investor has a better chance for a profit while buying acquired stocks of value up to 1 euro than for in case of stocks above 100 euro. Undoubtedly, cheaper companies have a higher growth prospect and may also have underestimated value. The acquisition of such a company to improve the quality of managing its potential should result in an increase in the value of the stocks. The interesting conclusion of these studies is that joint stock companies prepared for mergers may deliberately split stocks to make them more attractive to investors. In this way the investor may have the impression of buying stocks at a special price.

However, Authors also noticed that low price anomaly may occur at particular price range. The excessive rates of return were noticeable particularly for prices between about 0.10 euro to 0.90 euro what suggests that setting the price below 0.10 euro may discourage the purchase. As it was also proved, stocks with prices up to 1 euro are generally characterized by higher risk, therefore it may be assumed that discourage of purchase of stocks below 0.10 euro is conditioned by behavioural factors. Stocks below 0.10 euro might be perceived as not prestigious and investors may avoid them.

Research is important for science. It is some kind of proposition to explain low price anomaly in relation to the psychology of human behaviour, which is a new approach to this problem. The research conducted so far does not take into account analyses of the importance of perceiving figures in a decision-making process.

Study contributes to the literature in many aspects. At first it provides knowledge about low price anomaly in CE countries with special emphasis on M&A transactions. These transactions contain a large number of transactions at high values. Provided results are the next step to make them more successful what has a great economic importance. It was proved that setting the stock prices below 1 euro attracts investors' attention. However, research results suggest that the low price anomaly may have a discontinuous character and it may exists in defined price range what put a new insight into conducted studies in this area.

The Authors are aware of the limitations of the presented study, both in terms of scope and proposed methods. In the further perspective, the actions should be aimed at extending the scope of the study to all entities participating in the trading on the capital market and to answer the question in which price ranges there is a phenomenon of low price anomaly and to what extent its occurrence is conditioned by external factors, e.g. stock market trends, socio-economic conditions or economic development. It is also important to try to assess what affects the price anomaly more – the tendency to price rounding or the anchoring effect that occur in the economy.

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