FUNDAMENTAL ANOMALIES CONNECTED WITH THE VALUE OF MARKET MULTIPLES AND FIRM SIZE

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Abstract. The subject of the study were market multiples' anomalies. Analyses were focused upon food companies listed on the Warsaw Stock Exchange. The differences in rates of return between portfolios formed from companies with low market multiples and with high ones, were discussed. Not only classic market multiples, like price to earnings and price to book ratio, were considered, but also market multiples based on sales and cash flow were used. In addition, the risk and the size effect was analysed. All companies were divided into two groups: "small" and "big" firms, based on the market value of their share capital. The aim of the article was to explore possible connections between market multiples, firm size and expectations of future rates of return. Our results suggest that investments in stocks of bigger companies are safer and more profitable.

Key words: capital market, semi-variance, equally weighted portfolio, food companies, Warsaw Stock Exchange

INTRODUCTION

The occurrence of market anomalies is still the subject of numerous analyses. This phenomenon is interesting with respect to both theoretical and application aspects. From the perspective of theories describing the behaviour of capital markets, occurrence of long-term and repetitive anomalies suggests fundamental weaknesses in the efficient mar-

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ket hypothesis. The subject of the present research is not, however, to prove or refute this hypothesis. The research concentrates only on anomalies connected with the rate of market multiples and firm size in relation to the market capitalization value of the firm.

Research suggests that the market multiples effect is connected with the firm size effect. Small firms are characterised by higher risk, higher rates of return on capital market and lower market multiples in comparison to bigger entities [Banz 1981, Reinganum 1981].

The main objective of the present research is to identify the relation between the value of selected market multiples, firm size and the achieved future rate of return for portfolios formed with food companies listed on the Warsaw Stock Exchange (WSE). An additional aim is to examine whether the size of the company and value of market multiples affects the risk of investment in stocks.

Analyses concerning the profitability of investment strategies based on values of market multiples were conducted from the Warsaw Stock Exchange.

The present study combines the firm size effect with the market multiples effects and rates of return on capital. Additionally, the risk measured with semi-variance was included.

MARKET MULTIPLES

Market multiples provide information on how the market evaluates a given firm. Market data and financial firm results are used to estimate values of these multiples. In literature on the subject, apart from standard market multiples, such as *P/BV* or *P/E*, multiples such as those relating firm market value to cash flows or sales are used [Barbee et al. 2008]. The most popular indicator of firm evaluation by the market is *P/E* ratio, which relates earnings per one ordinary share to its market price:

$$P/E = \frac{market\ price\ per\ share}{net\ profit\ per\ share}$$

A high value of this multiple means that investors evaluate this firm positively [Tarczyński and Łuniewska 2005].

As for *P/BV* ratio, the price of one ordinary share is related to the firm's book value, estimated per one ordinary share; therefore, this multiple outlines the firm's market value in relation to its book value:

$$P/BV = \frac{market\ value\ per\ share}{book\ value\ per\ share}$$

where:

$$book\ value\ per\ share = \frac{assets - liabilities}{number\ of\ shares}$$

A low value of this multiple may indicate that the firm is not functioning well [Tarczyński and Łuniewska 2005].

Cash flows in a firm show what cash is generated in the course of its operating, investment and financial activities. The *P/CF* is the ratio of market price per share and the net cash flow per one ordinary share:

$$P/CF = \frac{market\ price\ per\ share}{cash\ flows\ per\ share}$$

$$cash\ flows\ per\ share = \frac{flows\ from\ operating\ activities - preferred\ dividents}{number\ of\ shares}$$

Reaching break-even point and generating profit is connected with the ability to sell produced goods and services. Accordingly, a potentially significant ratio for investors is the turnover value per share, i.e. *P/S* ratio*:*

$$P/S = \frac{market\ value\ per\ share}{sales\ per\ share}$$

$$sales\ per\ share = \frac{net\ sales}{number\ of\ shares}$$

REVIEW OF THE LITERATURE

The article of Basu [1977] is frequently claimed to be the first publication analyzing the impact of market multiples on future firm profitability, yet such research was conducted earlier by, for instance, William Breen [1968]. He investigated firms from index S&P500 in 1953–1966, using the COMPUSTAT database. This database was established in 1962 and comprised data since 1950. For particular years, equally weighted portfolios were formed (with 10 and 50 firms) from firms with the lowest and the highest *P/E* ratio values. The results indicate that portfolios formed from firms with lower *P/E* ratios had a higher annual rate of return in the following year than portfolios formed from firms with higher *P/E* ratios.

Similar results to those obtained by Basu [1977] were generated from research undertaken at the University of Chicago where the impact of firm size on profitability of stock investments was evaluated. Reinganum [1981] observed that investments in stocks of "small" firms are characterized by higher profitability in relation to investments in stocks of "big" firms with similar levels of beta coefficients, which indicates that this higher profitability cannot be explained in terms of risk premium in accordance with the Capital Asset Pricing Model (CAPM) [Reinganum 1981]. Reinganum claimed that this premium is connected with firm size. This effect was observed for both annual and two-year rates of return. The firm size effect was also investigated by Banz [1981].

Reinganum [1981] analyzed the results published by Basu [1977] and observed that there is a relation between firm size and the *P/E* ratio value. For single firms, this

relationship was insignificant (correlation coefficient 0.16), but taking into consideration portfolios formed (by Basu) for various *P/E* levels, this relationship was much stronger (correlation coefficient 0.82). In further research [1983], Basu confirmed the existence of a relationship between firm size and the P/E ratio. In general, investments in stocks of firms with low *P/E* ratio values were more profitable when taking into account return rates adjusted by risk. The apparent *P/E* ratio effect remained significant after dividing firms into subgroups due to their market capitalization value. Firm size effect was not observed when risk and the *P/E* ratio were taken into consideration concurrently. The *P/E* ratio effect was less significant for bigger firms than for smaller ones.

The market multiple effect, including basic multiples such as *P/E*, *P/BV* and those relating share price to other financial measures, is still the subject of research [Barbee et al. 2008, Hashemzadeh et al. 2011, Fama and French 2012].

Barbee et al. [2008] investigated the impact of market multiples values on future prices of stocks. Their research concerned profitability of equally weighted portfolios, formed from firms with various values of particular market multiples. Four market multiples were analyzed: *P/E*, *P/BV*, *P/S*, *P/CF*. The results have shown that the most significant relation to future rates of return is the *P/S* ratio. Furthermore, research conducted by Hashemzadeh has shown that firms with the lowest *P/E* ratios (first quintile) and the highest (fifth quintile) had higher systematic risk measured by their beta coefficients in comparison to firms from middle quintiles.

Fama and French [2012], in research conducted in four regions (North America, Europe, Japan, and Asia Pacific), covering the period 1989–2011, did not observe the occurrence of premiums for firm size. Subsequently they noticed that firm size has impact on return rates if it is considered jointly with *P/BV* ratio. In their research they used quintile equally weighted portfolios (with the same value of particular stocks in portfolio).

Research regarding anomalies connected with values of market multiples was also carried out for firms listed on the WSE and a significant *P/E* ratio effect was found. Firms from bottom deciles were characterized by higher return rates whereas strategies based on *P/BV* ratio effect were the most effective for firms from middle deciles [Czekaj et al. 2001].

In Poland, there was also research on the use of these multiples in portfolio analysis [Tarczyński and Łuniewska 2005, Garsztka and Rutkowska-Ziarko 2012, Rutkowska-Ziarko and Ksepka 2012].

In research conducted for the construction industry, the analysis focused on the impact of *P/E* and *P/BV* ratios, as well as market multiples, by relating share price to revenues from sales and the value of working capital on the future profitability of investment portfolios. Among these multiples, the most profitable were portfolios formed from firms with low values of market multiples, whereas only for *P/S* ratio the most profitable were portfolios for middle values of this multiple [Rutkowska-Ziarko and Sochoń 2014].

Firm size effect was analyzed on the WSE on the basis of data concerning all firms listed on the WSE in 2002–2010 [Sekuła 2013]. It was observed that small firms were the most risky and the least profitable. Risk was measured with classic beta coefficients.

RESEARCH RESULTS

The research was carried out for 19 firms from the food industry, listed on the Warsaw Stock Exchange. The analysis included share prices from 2011–2013. The firms which were selected had their annual financial statements for 2010–2012 available. They were ranked in order of the market value of share capital and then divided into two groups.

Firm size was measured on the basis of market value of share capital [Handa et al. 1989] from 3 March 2014. Ten firms were put in the first group (small firms), and nine in the second group (big firms). For each firm, values of the aforementioned market multiples were estimated. These estimations were based on data from annual financial statements and closing stock prices from 21st March of the year following the year of the latest financial statement. Also, the firms were divided based on the estimated values of market multiples.

The analysis of investments commenced on 21st March each year. It was assumed that shares were bought on this day. The rate of return was calculated using the closing price at the end of each day. For example, the rate of return for one week was calculated based on the share prices on 28th of March and 21th March in the given year.

For firms divided in this way, the rates of return of equally weighted portfolios in particular years were calculated. The results of these calculations are shown in Tables 1 and 2. Moreover, firms were divided into small and big. For each division, the highest return rate of the weekly, 2-weekly, monthly, 2- and 3-month investment period in particular years was highlighted in bold font. Return rates of these portfolios are also shown in Figures 1, 2 and 3.

Table 1. Return rates of equally weighted portfolios

Length of investment period	Year	Values of *P/S* index				Values of *P/E* index			
		low		high		low		high	
		small firms	big firms	small firms	big firms	small firms	big firms	small firms	big firms
1	2	3	4	5	6	7	8	9	10
Week	2011	−0.005	−0.016	−0.015	−0.002	−0.004	−0.030	−0.013	0.021
	2012	0.003	0.025	−0.011	−0.016	−0.027	0.034	0.033	−0.015
	2013	0.003	0.015	−0.057	0.036	0.029	0.038	−0.021	0.013
Two weeks	2011	−0.004	−0.028	0.032	−0.016	0.006	−0.055	0.047	0.025
	2012	−0.026	0.046	−0.016	−0.021	−0.038	0.074	0.011	−0.031
	2013	−0.025	0.021	−0.064	0.034	−0.009	0.044	−0.061	0.011
Three weeks	2011	−0.025	−0.031	0.012	−0.012	−0.008	−0.076	0.031	0.042
	2012	−0.038	0.009	−0.037	0.002	−0.067	0.073	−0.001	−0.048
	2013	0.001	0.028	−0.032	0.043	0.002	0.056	−0.086	0.016
Month	2011	−0.061	−0.036	0.120	−0.005	−0.020	−0.077	0.169	0.051
	2012	−0.122	−0.050	−0.049	−0.016	−0.064	0.057	−0.085	−0.108
	2013	−0.082	−0.059	−0.101	−0.059	−0.035	−0.082	−0.169	−0.036

Table 1, cont.

1	2	3	4	5	6	7	8	9	10
Two months	2011	–0.103	–0.037	–0.043	–0.103	–0.076	–0.135	–0.037	–0.012
	2012	–0.165	–0.119	–0.098	–0.157	–0.155	–0.107	–0.102	–0.159
	2013	0.055	0.024	–0.051	–0.002	0.173	–0.010	–0.177	0.032
Three months	2011	–0.127	–0.046	–0.114	–0.065	–0.114	–0.071	–0.077	–0.042
	2012	–0.224	–0.185	–0.110	–0.105	–0.168	–0.106	–0.111	–0.184
	2013	0.138	–0.026	–0.096	0.020	0.193	–0.054	–0.205	0.047

Source: Own elaboration.

Table 2.   Return rates of equally weighted portfolios

Length of investment period	Year	Values of *P/BV* index				Values of *P/CF* index			
		low		high		low		high	
		small firms	big firms	small firms	big firms	small firms	big firms	small firms	big firms
Week	2011	–0.023	–0.032	0.004	0.017	–0.009	–0.020	–0.006	0.002
	2012	0.012	0.039	–0.020	–0.034	–0.034	0.028	0.038	–0.020
	2013	–0.020	0.016	–0.035	0.036	0.019	0.041	–0.064	0.011
Two weeks	2011	0.023	–0.060	0.004	0.024	0.073	–0.045	–0.022	0.006
	2012	–0.016	0.062	–0.026	–0.041	–0.044	0.052	0.015	–0.029
	2013	–0.015	0.034	–0.074	0.021	–0.022	0.053	–0.034	0.003
Three weeks	2011	0.000	–0.062	–0.013	0.027	0.065	–0.057	–0.035	0.020
	2012	–0.022	0.033	–0.053	–0.029	–0.047	0.036	–0.016	–0.032
	2013	0.042	0.044	–0.072	0.028	–0.026	0.048	–0.024	0.024
Month	2011	0.094	–0.077	–0.035	0.047	0.211	–0.065	–0.057	0.031
	2012	–0.117	0.005	–0.055	–0.085	–0.074	0.016	–0.077	–0.098
	2013	0.005	–0.087	–0.188	–0.031	–0.079	–0.089	–0.091	–0.029
Two months	2011	–0.057	–0.121	–0.089	0.002	0.039	–0.138	–0.138	0.023
	2012	–0.162	–0.111	–0.102	–0.167	–0.130	–0.114	–0.120	–0.164
	2013	0.177	0.023	–0.173	–0.001	0.090	0.002	–0.096	0.019
Three months	2011	–0.110	–0.128	–0.130	0.038	–0.004	–0.099	–0.186	0.002
	2012	–0.211	–0.146	–0.122	–0.153	–0.146	–0.116	–0.127	–0.192
	2013	0.176	–0.045	–0.134	0.039	0.095	–0.001	–0.089	–0.005

Source: Own elaboration.

Equally weighted portfolios formed on the basis of *P/S* ratio

Equally weighted portfolios formed on the basis of *P/E* ratio

Equally weighted portfolios formed on the basis of *P/BV* ratio

Equally weighted portfolios formed on the basis of *P/CF* ratio

——— Equally weighted portfolios formed from firms with lower values of particular multiple

- - - - Equally weighted portfolios formed from firms with higher values of particular multiple
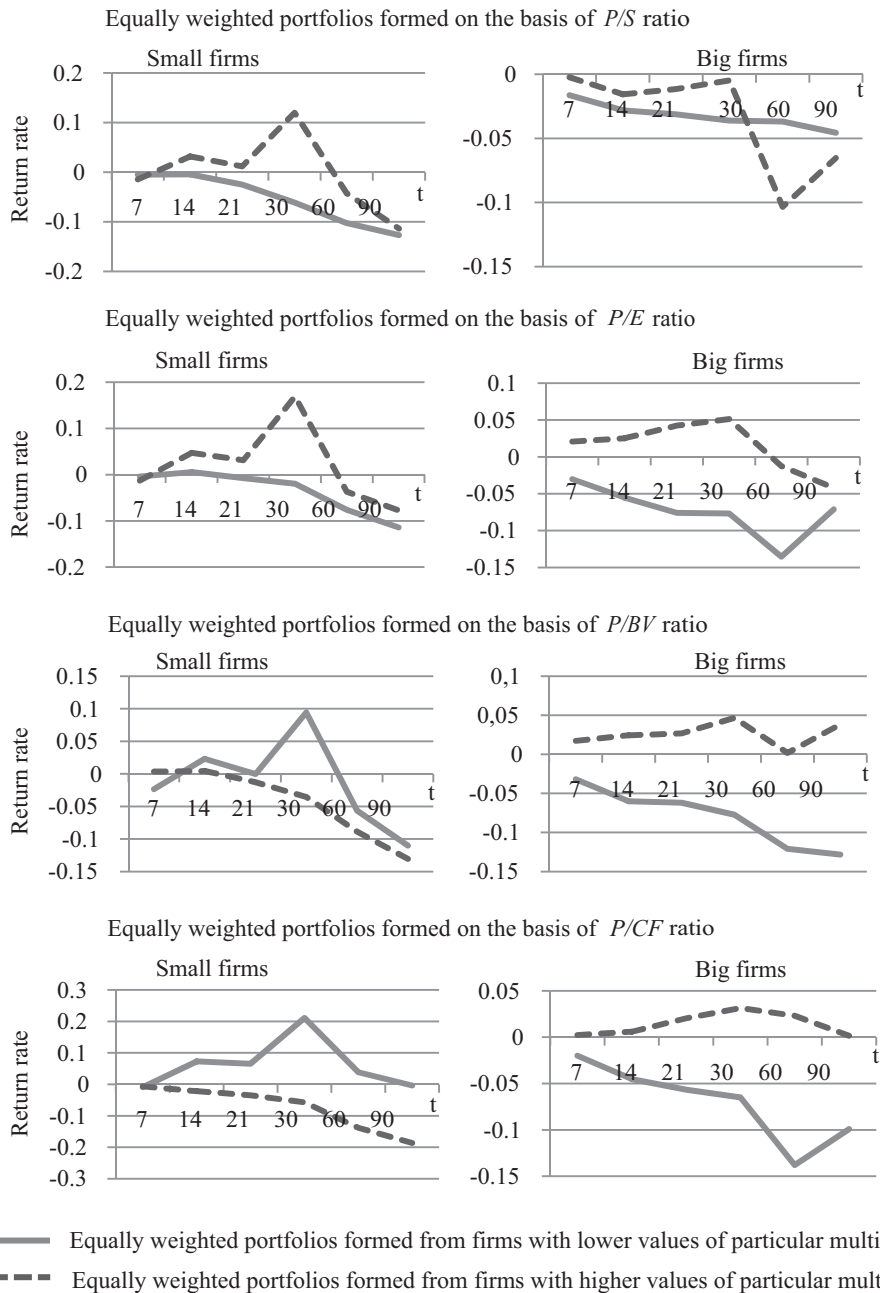
Fig. 1. Return rates of equally weighted portfolios for various lengths of investment periods (1–90 days) in 2011 with division based on firm size and values of particular market multiples
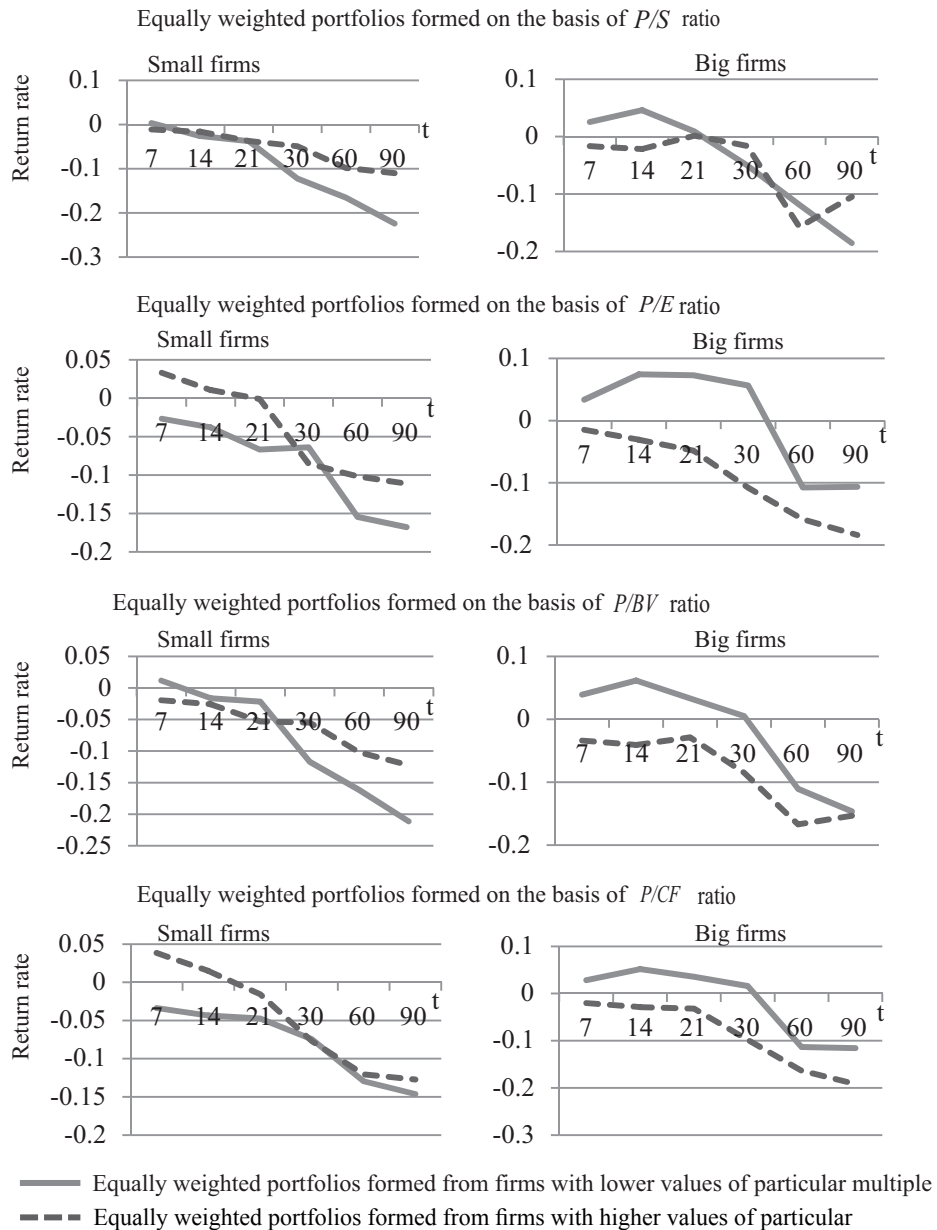
Source: Own elaboration.

Equally weighted portfolios formed on the basis of *P/S* ratio

Equally weighted portfolios formed on the basis of *P/E* ratio

Equally weighted portfolios formed on the basis of *P/BV* ratio

Equally weighted portfolios formed on the basis of *P/CF* ratio

——— Equally weighted portfolios formed from firms with lower values of particular multiple

- - - - Equally weighted portfolios formed from firms with higher values of particular

Fig. 2.   Return rates of equally weighted portfolios for various lengths of investment periods (1–90 days) in 2012 with division based on firm size and values of particular market multiples
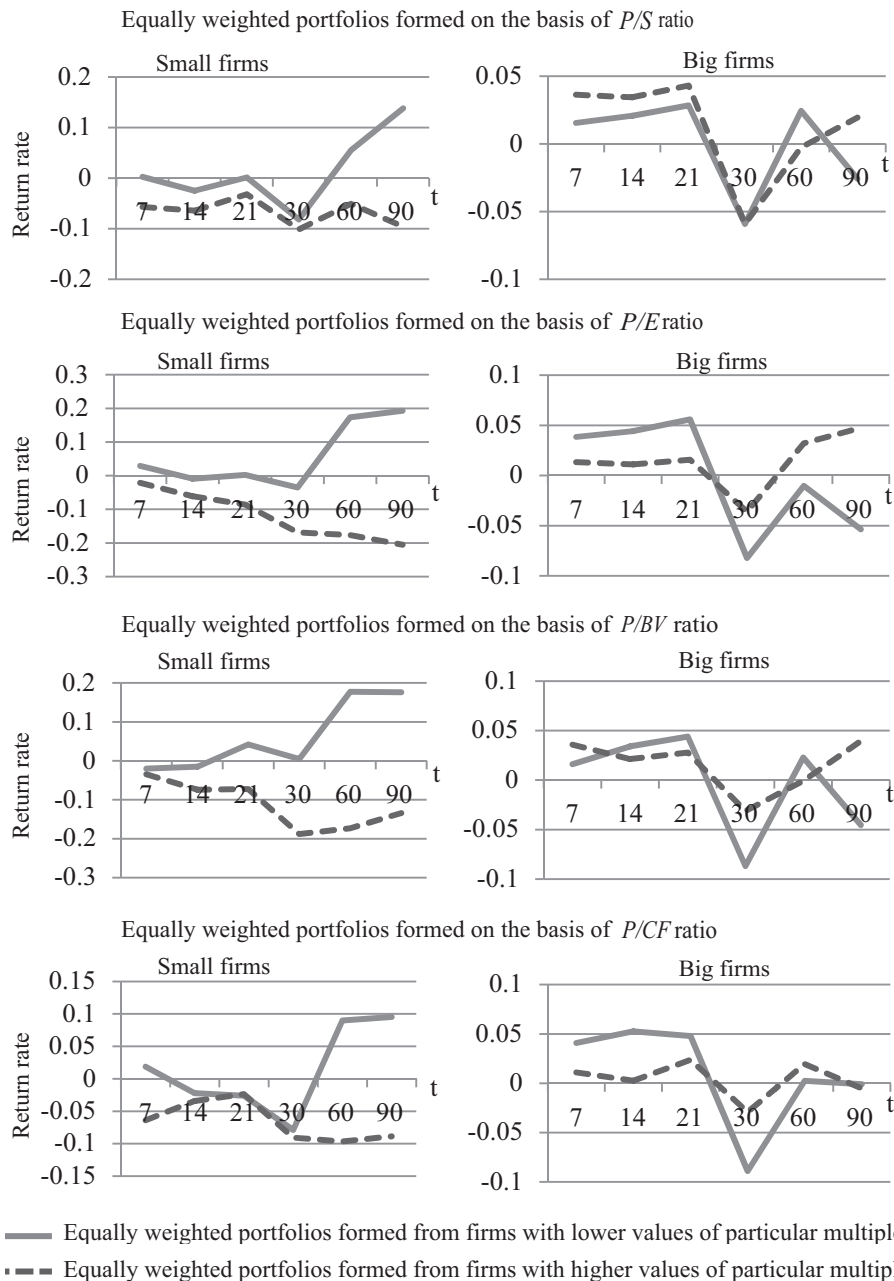
Source: Own elaboration.

Equally weighted portfolios formed on the basis of *P/S* ratio

Equally weighted portfolios formed on the basis of *P/E* ratio

Equally weighted portfolios formed on the basis of *P/BV* ratio

Equally weighted portfolios formed on the basis of *P/CF* ratio

—— Equally weighted portfolios formed from firms with lower values of particular multiple

- - - Equally weighted portfolios formed from firms with higher values of particular multiple

Fig. 3.   Return rates of equally weighted portfolios for various lengths of investment periods (1–90 days) in 2013 with division based on firm size and values of particular market multiples

Source: Own elaboration.

On the basis of the results presented in Tables 1 and 2 it can be observed that for *P/S* ratio, the highest profitability had portfolios formed from big firms with high values of this multiple. It is highly significant for investments up to 1-month period. For *P/E* ratio, the advantage of small firms with low values of this multiple was observed (investments up to 1-month period).

On the other hand, for the *P/BV* ratio, insignificantly higher profits brought portfolios formed from firms with low values of this multiple, mainly big firms, particularly for investments up to 1-month period. In the case of the *P/BV* ratio, big firms, irrespective of the multiple value, were more profitable than small firms, which is clearly noticeable for investments up to 1-month period. Portfolios of big firms were more profitable than portfolios of small firms in 10 cases out of 12 (1-month period of investments).

However, as for the *P/CF* ratio, the most profitable were big firms with low values, which indicates that the growth potential, in terms of the market value of stocks, was underestimated in relation to cash flow values (Table 2).

For all considered multiples, the dominance of firms with higher market capitalization over firms with lower market capitalization is observable (Tables 1 and 2).

In 2011, in the case of the *P/BV* and *P/E* ratios, return rate, obtained for portfolios of small firms in comparison to portfolios of big firms were completely different. It can be also observed that portfolios for high multiple values tended to be more profitable.

In 2012, the majority of cases that were more profitable were portfolios formed from firms with low values of market multiples; nonetheless, increased profitability is more noticeable for big firms and shortly after portfolio purchase.

In 2013, the most profitable portfolios were those that were formed from small firms with low values and those that were formed from big firms with low values of the *P/BV* ratio.

Stock investment risk was calculated for particular firms. Risk was measured as semi--variance to risk-free rate, which was assumed as POLONIA index. The semi-variance was calculated using the daily rate of return from 1st January to 20th March.

In each year, correlation coefficients between values of market multiples, market value of firms and semi-variance were estimated. The results of these estimations are shown in Table 3.

In all years there is a negative correlation between firm size and semi-variance. A similar relation can be found for market multiples. Concurrently, the correlation coefficients between market value and particular market multiples were positive. It suggests that big firms were characterized by lower risk and were evaluated more highly by the market in comparison to small firms.

Table 3. Correlation matrix of market multiples, market value and semi-variance in particular years

2011	P/S	P/E	P/BV	P/CF	Size	Semi-variance
P/S	1					
P/E	−0.066	1				
P/BV	0.318	0.040	1			
P/CF	−0.228	0.044	0.140	1		
Size	0.335	−0.013	0.895	0.031	1	
Semi-variance	0.314	−0.256	−0.383	−0.155	−0.477	1
2012	P/S	P/E	P/BV	P/CF	Size	Semi-variance
P/S	1					
P/E	−0.117	1				
P/BV	0.589	−0.037	1			
P/CF	0.174	0.327	0.120	1		
Size	0.718	−0.073	0.858	0.221	1	
Semi-variance	−0.561	0.041	−0.383	−0.032	−0.341	1
2013	P/S	P/E	P/BV	P/CF	Size	Semi-variance
P/S	1					
P/E	0.139	1				
P/BV	0.559	0.091	1			
P/CF	0.250	0.096	0.111	1		
Size	0.603	0.197	0.851	0.102	1	
Semi-variance	−0.447	−0.257	−0.281	−0.306	−0.308	1

Source: Own elaboration.

CONCLUSIONS

The market multiple effects were different in each year of the analyzed period. It can also be shown that those effects were different for big and small firms. Considering the whole of the analyzed period, it can be seen that portfolios formed from big firms were characterized by higher profitability in relation to those formed from small firms. For the *P/CF* and *P/E* ratios, the most profitable were firms with low values of these multiples, but for the *P/CF* ratio alone profitability was associated with big firms.

A negative correlation between market multiples and semi-variance was observed, which indicates a lower market evaluation of firms with higher risk. Also, there is a negative correlation between market value of share capital and semi-variance, which suggests that generally small firms are more risky. Concurrently, correlation of firm size with particular market multiples was usually positive. As a result, it can be concluded that big firms were characterized by lower risk and were evaluated better by the market in comparison to small firms.

REFERENCES

Banz, R.W. (1981). The Relationship Between Return and Market Value of Common Stocks. Journal of Financial Economics, 9, 3–18.

Barbee, W.C., Jeong, J.-G., Mukherji, S. (2008). Relations Between Portfolio Returns and Market Multiples. Global Finance Journal, 19, 1–10.

Basu, S. (1977). Investment Performance of Common Stocks in Relation to their Price-Earnings Ratios: a Test of the Efficient Market Hypothesis. Journal of Finance, 32, 3, 663–682.

Basu, S. (1983). The Relationship Between Earnings' Yield, Market Value and Return for NYSE Common Stocks. Further Evidence. Journal of Financial Economics, 12, 129–156.

Breen, W. (1968). Low Price-Earnings Ratios and Industry Relatives. Financial Analyst Journal, 24, 4, 125–127.

Czekaj, J., Woś, M., Żarnowski, J. (2001). Efektywność giełdowego rynku akcji w Polsce. PWN, Warszawa.

Fama, E.F., French, K.R. (2012). Size, value, and momentum in international stock returns. Journal of Financial Economics, 457–472.

Garsztka, P., Rutkowska-Ziarko, A. (2012). Budowa portfela akcji przy wykorzystaniu wskaźnika cena/zysk oraz płynności transakcyjnej. Zeszyty Naukowe Uniwersytetu Ekonomicznego w Poznaniu, Matematyka i Informatyka na Usługach Ekonomii, 242, 69–81.

Handa, P., Kothari S.P., Wasley, C. (1989). The Relation Between the Return Interval and Betas, Implications for the Size Effect. Journal of Financial Economics, 23, 79–100.

Hashemzadeh, N., Davis, E., Wade, E. (2011). The Usefulness of Price to Earnings Ratio (P/E) in Predicting Share Price Behavior: a Review of Recent Evidence. International Research Journal of Applied Finance, 2, 11, 1272–1285.

Reinganum, M.R. (1981). Abnormal Returns in Small Firm Portfolio. Financial Analyst Journal, 37, 2, 52–56.

Rutkowska-Ziarko, A., Ksepka, A. (2012). Wykorzystanie wskaźników rynkowych do wyboru portfela inwestycyjnego. [In:] B. Pawełek (Ed.), Modelowanie i prognozowanie zjawisk społeczno–gospodarczych. Aktualny stan i perspektywy rozwoju. Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie, Kraków, 179–188.

Rutkowska-Ziarko, A., Sochoń, M. (2014). Rentowność inwestycji giełdowych w branży budowlanej na tle wybranych wskaźników rynkowych. Studia i Prace Kolegium Zarządzania i Finansów, 139, 107–120.

Sekuła, P. (2013). Szacowanie efektu wielkości spółki na GPW w Warszawie. Finanse, Rynki Finansowe, Ubezpieczenia, 60, 105–114.

Tarczyński, W., Łuniewska, M. (2005). Analiza portfelowa na podstawie wskaźników rynkowych i wskaźników ekonomiczno-finansowych na Giełdzie Papierów Wartościowych w Warszawie. Zeszyty Naukowe Uniwersytetu Szczecińskiego, Prace Katedry Ekonometrii i Statystyki, 16, 257–271.

ANOMALIE FUNDAMENTALNE ZWIĄZANE Z WARTOŚCIĄ WSKAŹNIKÓW RYNKOWYCH ORAZ WIELKOŚCIĄ SPÓŁKI

Streszczenie. Przedmiotem opracowania są anomalie związane ze wskaźnikami rynkowymi. Analizy dotyczyły spółek branży spożywczej notowanych na GPW w Warszawie. Zbadano różnice między stopami zwrotu portfeli równomiernych zbudowanych z akcji spółek o małych wartościach wskaźników rynkowych a portfelami zbudowanymi ze spółek o dużych wartościach tych wskaźników. Poza klasycznymi wskaźnikami rynkowymi, takimi jak cena/zysk i cena/wartość księgowa, wykorzystano także wskaźniki zbudowane na

podstawie przychodów ze sprzedaży oraz przepływów pieniężnych. Ponadto przeanalizowano ryzyko oraz efekt wielkości spółki. Spółki zostały podzielone na „duże" i „małe" ze względu na wartość rynkową kapitału akcyjnego. Celem było zbadanie związku między wartością wybranych wskaźników rynkowych oraz wielkością spółki a przyszłą stopą zwrotu. Uzyskane wyniki pokazują, że inwestowanie w akcje większych spółek jest bezpieczniejsze i bardziej opłacalne.

Słowa kluczowe: rynek kapitałowy, semiwariancja, portfel równomierny, firmy spożywcze, Giełda Papierów Wartościowych w Warszawie