The Effect of Financial Ratios on the Stock Prices: Evidence from the Polish Stock Exchange

Vliv finančních ukazatelů na ceny akcií: aplikace na polskou burzu cenných papírů

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Abstract

Stock prices can be influenced by many factors; the macroeconomic factors, industrial specifics and company characteristics are three main categories. The object of this paper is to analyze relationship between selected financial ratios and stock prices of the food, energy, metallurgical and chemical companies listed on the Polish Stock Exchange (Giełda Papierów Wartościowych w Warszawie, GPW) over the 2006–2015 period. The Johansen test that investigates long-term equilibrium between stock prices and financial ratios is used. The short-run dynamics of the long-term equilibrium relationship will be examined using the Vector Error Correction Model (VECM). The panel regression method that analyze relationships between data set in two-dimensional space follows. The findings indicate the impact of the rentability, the liquidity and the financial leverage to the selected stock prices of companies listed on the GPW.

Keywords

financial ratios, cointegration, Poland, industry, stock exchange, panel regression

JEL Codes

L60, M21, O52

Abstrakt

Ceny akcií mohou být ovlivněny mnoha faktory, přičemž lze klasifikovat tři základní kategorie proměnných, a to makroekonomické proměnné, odvětvová specifika a charakteristiky společnosti. Cílem je analyzovat vazbu mezi vybranými finančními ukazateli a cenami akcií potravinářských, energetických, hutnických a chemických společností obchodovaných na polské burze cenných papírů (Giełda Papierów Wartościowych w Warszawie, GPW) v období 2006–2015. Johansenův kointegrační test je využit ke zkoumání dlouhodobé vazby mezi cenami akcií a finančními ukazateli. Následuje zkoumání krátkodobé dynamiky dlouhodobého rovnovážného vztahu prostřednictvím modelu korekce chyb (VECM). Využito je také metody panelové regrese, která analyzuje data ve dvourozměrném prostoru. Výsledky naznačují převažující vliv rentability, likvidity a finanční páky na ceny akcií vybraných společností obchodovaných na GPW.

Klíčová slova

finanční ukazatele, kointegrace, Polsko, průmysl, burza cenných papírů, panelová regrese

Introduction

Development of stock prices and identification of the variables that can affected them is long time problematics. There are many fundamental factors that can effect stock prices. Three main categories can be defined; macroeconomic factors, industrial specifics and company characteristics. This study is oriented on company characteristics and their impact on stock prices. The importance of information in financial statements and their influence on stock prices can be found in the studies of Ball and Brown (1968) and Beaver (1968), who emphasized them as the first.

At the beginning the modern portfolio theory and model CAPM were used methodologically. But the research was extended to the Efficient Market Hypothesis (Fama, 1970). According to the theory the efficient market, all the relevant information about changes in variables are fully reflected in the current stock prices preventing investors from earning abnormal profits.

This study is focused on relationship between financial ratios and stock prices of companies listed on the GPW. The GPW is the biggest stock exchange in Central and Eastern Europe with market capitalisation 1 340 bil. PLN in March 2018. The GPW is typical by high liquidity and by many new IPOs. The 32 food, energy, metallurgical and chemical companies are analyzed. The food, energy, metallurgical and chemical industry present basic parts of every national economy. The importance of food industry is related to the provision of food to the population by the production and sale of quality and safe food. The chemical production is considered as a basic element of the production in many branches of the manufacturing industry. The metallurgical industry is the basis for the production of semi-finished products and finished products made of metal for production especially in mechanical engineering and metalworking. The energy industry generates electricity that is necessary to production in other industries and this distributed among the population. The selected industries had a share of approximately 9% of the GDP in period 2006–2015. Financial ratios include the return on assets (ROA), the return on equity (ROE), the financial leverage (FL), the debt ratio (DR), the equity ratio (ER) and the acid test (L2).

The contribution is divided into several sections: A Review of the Literature follows the Introduction. Then, the section Data and Methodology is presented, the part Findings follows, and the final section is the Conclusion.

1 Review of the Literature

Many studies examine the relationship between stock prices or stock returns and financial ratios, but a lot of them are focused on the developed stock markets such as markets of the USA and Asia. We can find studies oriented on Central European countries despite marginal position of their stock markets. These studies are presented in this section.

Asteriou and Dimitropoulos (2009) investigated specific ratios and their effect on stock returns of 101 non-financial firms listed at the Athens Stock Exchange from 1995 to 2004.

The results show that the ratios of working capital to total assets and net profit to sales (ROS) have a negative impact on stock returns, while the ratios of net profit to total assets (ROA) and sales to total assets affect returns positively.

Atanasov and Nitschka (2017) examined the relationship between firm size, economic risks, and stock returns. They found that the value premium in small stocks is consistently priced in the cross-section of international returns, whereas the value premium in big stocks is not. The results hold true for regional and global stock markets.

Bessler et al. (2007) analyzed the impact of fundamental variables of individual banks on stock market returns using data from a panel of 235 European banks from 1991 to 2005. The most important finding is a positive impact of the ratio of loans to total assets, the ratio of non-interest income to total income, and the ratio of off-balance sheet items to total assets on subsequent bank stock returns.

Casterén et al. (2006) examined the driving forces of the stock returns of EU banks. They used 53 EU banks and data from 1991 to 2004. They found that although short-term expected returns are mainly driven by the momentum of past returns and past leverage, over the longer term, returns showed some mean reversion to shocks.

Drummen and Zimmermann (1992) analyzed the importance of various market and sector factors to stock price volatility. They used 11 European countries over the 1986–1989. The results showed that country factors can explain 19% of the average stock variance, the impact of the world stock market is 11%, European market trends explain 8% and industrial trends 9%. Their analysis showed the importance of various market and sector factors to European stock price volatility.

Isakov and Sonney (2003) investigated the influences of industrial and country factors in international stock returns. They used data of 20 developed countries over the period 1997–2000. The findings showed the rapidly increasing impact of industry effects. The authors interpreted this result as an evidence of the increasing globalization of international stock markets.

Muradoglu and Sivaprasad (2009) explored the impact of a firm´s leverage on stock returns. They used 788 non financial companies listed on the London Stock Exchange for the period 1980–2008. Data were classified into 9 main industries: oil & gas, basic material, industries, consumer goods, healthcare, consumer services, telecommunications, utilities and technology. The results showed that leverage has a negative relation to stock returns.

2 Data and Methodology

The 32 food, energy, chemical and metallurgical companies listed on the GPW are used. In particular, there are 10 food firms, 6 energy companies, 5 chemical firms and 11 metallurgical companies. The list of analyzed companies are demonstrated in Table 1.

Table 1: Analyzed companies

Energy companies	Food companies	Metallurgical companies	Chemical companies
Polenergia	Ambra	Drozapol	Ciech
Zespół Elektrociepłowni	Atlanta Poland	Stalprofil	Grupa Azoty Zakłady Azotowe Puławy
Grupa Lotos	Colian	Alchemia	Grupa Azoty Zakłady Chemiczne Police
Polski Koncern Naftowy Orlen	Gobarto	Boryszew	Synthos
Polskie Górnictwo Naftowe i Gazownicto	Grupa Zywiec	Cognor holding	Bioton
Skotan	Indykpol	Ferrum	
	Kruszwica	Grupy Kęty	
	Pepees	Impexmetal	
	Wawel	Mennica Polska	
	Wilbo	Odlewnie Polskie	
		Stalprodukt	

Source: Authors´calculations
(https://www.gpw.pl/en-home)

The market capitalisation of selected companies present 10.11% of the market capitalisation of GPW, as Table 2 shows. It means, the significant share of market capitalisation of selected companies is detected. Data with an annual frequency will be used for the period 2006–2015. Data on stock prices are from Yahoo Finance and web portal Stooq. Stock prices are measured by the average of daily values for each year. The reason is the volatility changes are not ignore.

Table 2: Market capitalisation of selected companies

Capitalisation of GPW	1, 340 bil. PLN
Capitalisation of seleted companies:	
Energy companies	101.216 bil. PLN
Food companies	10.059 bil. PLN
Metallurgical companies	11.681 bil. PLN
Chemical companies	12.569 bil. PLN
Share of the selected companies	10.11%

Source: Authors´calculations
(https://www.gpw.pl/en-home, https://stooq.com/)

The financial ratios of rentability, liquidity and indebtedness are used. The rentability is an important factor for investors, because the rentability reflects possibility of generating new resources and achieving the profit with using invested capital. The liquidity is important for the financial stability of the company. The ability of paying of companies liabilities is related to the enough of the financial means. But too high liquidity causes inadequately using of the capital in making profit. The indebtedness show the share of using own capital and debt financing. The acceptable high of debt financing can be positive to the rentability and that can influence stock prices.

The financial ratios included are as follows:

- the return on assets (ROA) calculated as

$$ROA = \frac{operation\ profit}{total\ assets} \tag{1}$$

- the return on equity (ROE) calculated as

$$ROE = \frac{operation\ profit}{equity\ capital} \tag{2}$$

- the financial leverage (FL) calculated as

$$FL = \frac{total\ assets}{shareholders'\ equity} \tag{3}$$

- the debt ratio (DR) calculated as

$$DR = \frac{liabilities}{total\ assets} \tag{4}$$

- the equity ratio (ER) calculated as

$$ER = \frac{own\ capital}{total\ assets} \tag{5}$$

- the acid test (L2) calculated as

$$L2 = \frac{(currents\ assets - inventory)}{short - term\ liabilities} \tag{6}$$

The ROA is related to the total effectivity of the companies and ability to generate the profit. The ROA reflects profitability of all capital resources. The ROE gives information about the profitability of the shareholders´capital. And the FL is related to the ROE. The FL present the degree of change of the ROE when the capital structure is changed. The L2 is a strong indicator of whether a company has sufficient short-term assets to cover its immediate liabilities, which can influence the financial stability of the firm. The DR provides creditors and investors with a general idea what the share of the debt financing is using by the company. And the ER shows what the share of total assets is financed by the shareholders´capital. These time series are calculated using the financial statements of the companies and database Amadeus.

Before the empirical estimations the descriptive statistics is presented in Table 3. It specifies the mean, median, maximum, minimum and standard deviation. The table shows that the maximum value of the stock prices is 86.35 PLN for chemical companies, and the minimum value is 0.57 PLN for food firms. The chemical companies are typical by the highest standard deviation, that shows the market risk.

Table 3: Descriptive statistics of stock prices

Variables	Energy industry	Food industry	Metallurgical industry	Chemical industry
Mean	16.6375	1.9100	14.2079	37.2691
Median	16.9700	1.6800	9.7365	28.8778
Maximum	18.0025	2.9600	51.1721	86.3485
Minimum	14.4730	0.5676	2.6969	17.2593
Std. Dev.	1.2042	0.5308	13.9856	21.4494

Source: Authors´calculations

Following the descriptive statistics, the methodology is presented. First, the stationarity of the time series was tested by the Levin-Lin-Chu unit root test. Then, the data were subjected to correlation analyses to determine a linear relationship between stock prices and selected financial ratios.

Then, the long-term equilibrium relationships were analyzed by the Johansen test, determining the presence of cointegrating vectors as a VAR; the equation for the considered VAR model is as follows (Johansen and Juselius, 1990):

$$\Delta Y_{it} = C_0 + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{i,t-1} + \Pi Y_{i,t-1} + \eta_{it} \quad (7)$$

where Y_t is a vector of non-stationary variables, C_0 is a constant and η_t is the white noise term. ΔY_t means rate of growth or changes. The panel data set consists of N cross-sections observed over T time periods, where i presents the index for the cross-section, *t* is the index for the time dimension and *j=1,…, p* denote the number of factors in each cross-section. The variables Π and Γ in the matrix contain the value of the cointegrating vectors. The information in the coefficient matrix between the levels of Π is decomposed as $\Pi=\alpha\beta'$, where the relevant elements of the α matrix are adjustment coefficients, and the β matrix contains the cointegrating vectors. The first likelihood ratio for the null hypothesis of the precise *r* cointegrating vectors against the alternative *r + 1* vector is known as the maximum eigenvalue statistic. The second statistic for the hypothesis of at most r cointegrating vectors against the alternative is known as the trace statistic.

Further, the Vector Error Correction Model (VECM) that is the method to investigate the issue of causation. The method explores short-term deviations that are necessary to the achivement of the long-term equilibrium relationship between selected factors. The following VECM specification is applied:

$$\Delta y_{it} = \Pi y_{i,t-k} + \Gamma_1 \Delta y_{i,t-1} + \Gamma_2 \Delta y_{i,t-2} + \ldots + \Gamma_{k-1} \Delta y_{i,t-(k-1)} + u_{it} \quad (8)$$

where Δy_t means rate of growth or changes, ut denotes a $n \times 1$ vector of unobservable error terms. The variables Π and Γ in the matrix contain the value of the cointegrating vectors.

Then, the panel regression method that analyze relationships between data set in two-dimensional space is applied, the general mathematical equation is in accordance with Brooks (2002):

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \beta_2 X_{2,it} + \ldots + \beta_k X_{k,it} + \varepsilon_{it} \quad (9)$$

where Y_t is endogenous variable, specifically stock prices in a time *t*. X_{it} present an exogenous factors, respectively trading volume in the time *i*. The coefficients $\beta 0, \ldots, \beta k$ are parameters of regression function, and ε is uncorrelated stationary random variable.

3 Findings

At the beginning the correlation coefficients between the stock prices and financial ratios are demonstrated in Table 4. The correlation coefficients between stock prices and the ROE are statistically significant in all cases. The stock prices of metallurgical and chemical companies demonstrate statistically significant coefficients with the ROA. The stock prices of energy, food and chemical firms present statistically significant coefficients with the FL. Then, the correlation coefficients between stock prices of energy companies, metallurgical firms, chemistry firms and the DR and the ER are statistically significant. The stock prices of food companies, metallurgical firms, chemistry companies and the L2 show statistically significant correlation coefficients. The negative correlation coefficient means, when the value of financial ratio increases, the value of stock prices fell down and vice versa. The positive correlation coefficient denotes, when the value of financial ratios increases, the value of stock prices increases and vice versa.

Table 4: Correlation coefficients

Variables	Energy industry	Food industry	Metallurgical industry	Chemistry industry
ROA	0.1693	-0.0755	-0.7566*	0.6350*
ROE	-0.2440***	0.2570*	0.2875*	0.6694*
FL	-0.3480*	0.0180	-0.4207*	0.5066*
DR	0.3854*	0.0180	0.6676*	-0.3424**
ER	0.2606**	0.0231	0.7708*	-0.3953*
L2	0.2121	0.4969*	-0.4538*	0.3003**

Source: Authors´calculations

*Note: *, ** and *** denote significance at the 1%, 5% and 10% levels.*

Further the results of the Johansen cointegration test are shown. The Trace statistics and Max-Eigen Statistics were used. There was detected two cointegrating vectors between the stock prices of energy companies and the ROE, the FL, the DR and the ER as Table 5 shows. The results indicate that stock prices of energy companies were influenced by the ROE, the FL, the DR and the ER in the long-term.

Table 5: Results of the Johansen test – Energy companies

	r=0	r ≤1
Stock prices/ROA		
Trace Statistics	16.03	6.426
Max-Eigen Statistics	18.06	6.426
Stock prices/ROE		
Trace Statistics	68.90*	44.28*
Max-Eigen Statistics	43.02*	44.28*
Stock prices/FL		
Trace Statistics	62.81*	41.51*
Max-Eigen Statistics	39.17*	41.51*
Stock prices/DR		
Trace Statistics	137.9*	24.13**
Max-Eigen Statistics	134.7*	24.13**
Stock prices/ER		
Trace Statistics	27.11*	20.66***
Max-Eigen Statistics	18.97***	20.66***
Stock prices/L2		
Trace Statistics	29.92*	9.310
Max-Eigen Statistics	31.88*	9.310

Source: Authors´calculations

*Note: *, ** and *** denote significance at the 1%, 5% and 10% levels.*

The existence of the short-term deviation between the stock prices and the FL and the ER was confirmed by VECM. The significance of each model is computed using the F-statistics coefficient and the coefficient R-squared (R2). According to the results the correction to the long-run equilibrium should be occurred with probability 61% (FL) and 23% (ER) as Table 6 shows. The sign of the coefficient is, negative in all cases; this indicates that an increase in financial ratios has a negative impact on stock prices of selected companies.

Table 6: Results of the VECM – Energy companies

CointEq1	-0.6161 (0.03549) [-17.3617]	**CointEq1**	-0.2323 (0.0196) [-11.8262]
PRICE (-1)	0.0821 (0.0557) [1.4741]	**PRICE (-1)**	-0.4442 (0.0724) [-6.1369]
FL (-1)	0.1148 (0.0071) [15.9938]	**ER (-1)**	-90.1190 (8.3384) [-10.8076]
Constant	-8.7219 (0.8129) [-10.7284]	**Constant**	-1.0960 (0.1375) [-7.9670]
R2	0.9071	**R2**	0.8009
Adj. R2	0.9030	**Adj. R2**	0.7874
F-statistic	219.8485	**F-statistic**	59.0240

Source: Authors´calculations

Note: Standard errors are in ( ) and t-statistics is in [ ].

Two cointegrating vectors were revealed for two models and one cointegrating vector was detected for one model in the case of food companies. According to the result it is possible to confirm that food stock prices were influenced by the ROA and the ROE in the long-term, as results in Table 7 show. Other of the selected financial ratios do not have any impact on stock prices of analyzed food companies in the long-term.

Table 7: Results of the Johansen test – Food companies

	r=0	r ≤1
Stock prices/ROA		
Trace Statistics	166.2*	41.56*
Max-Eigen Statistics	155.5*	41.56*
Stock prices/ROE		
Trace Statistics	184.2*	88.48*
Max-Eigen Statistics	184.2*	88.48*
Stock prices/FL		
Trace Statistics	184.2*	7.661
Max-Eigen Statistics	184.2*	7.661
Stock prices/DR		
Trace Statistics	184.2*	7.661
Max-Eigen Statistics	184.2*	7.661

Stock prices/ER		
Trace Statistics	184.2*	7.043
Max-Eigen Statistics	184.2*	7.043
Stock prices/L2		
Trace Statistics	74.80*	23.14
Max-Eigen Statistics	74.12*	23.14

Source: Authors´calculations

*Note: *, ** and *** denote significance at the 1%, 5% and 10% levels.*

The short-term deviations are detected between the stock prices and the ROA and the ROE. The results of the VECM show that the correction to the long-run equilibrium should be occurred with probability 44% (ROA) and 53% (ROE) as Table 8 shows. The sign of the coefficient is, negative in the case of the ROA and the ROE; this indicates that an increase in financial ratios has a negative impact on stock prices of analyzed food companies.

Table 8: Results of the VECM – Food companies

CointEq1	-1.4412 -0.0786 [-18.3290]	**CointEq1**	-1.5334 -0.0833 [-18.4077]
PRICE (-1)	0.5559 -0.0546 [10.1744]	**PRICE (-1)**	0.7252 -0.061 [11.8758]
ROA (-1)	-14.3526 -1.4999 [-9.5690]	**ROE (-1)**	-12.6233 -1.296 [-9.7401]
Constant	-1.2511 -0.0439 [-28.4898]	**Constant**	-1.0228 -0.0302 [-33.7808]
R2	0.7969	**R2**	0.8024
Adj. R2	0.7923	**Adj. R2**	0.7978
F-statistics	170.7549	**F-statistics**	176.6455

Source: Authors´calculations

Note: Standard errors are in ( ) and t-statistics is in [ ].

Then, for three models, two cointegrating vectors were revealed. The results in Table 9 present that stock prices of the metallurgical companies were affected by the ROA, the ROE and the ER. The influence of the FL is very weak. According to the results it is possible to confirm that the ROA, the ROE, the ER and the FL have an impact on stock prices of the metallurgical companies in the long-term.

Table 9: Results of the Johansen test – Metallurgical companies

	r=0	r ≤1
Stock prices/ROA		
Trace Statistics	377.4*	57.45*
Max-Eigen Statistics	360.9*	57.45*
Stock prices/ROE		
Trace Statistics	207.1*	63.27*
Max-Eigen Statistics	179.2*	63.27*
Stock prices/FL		
Trace Statistics	205.5*	31.30***
Max-Eigen Statistics	210.4*	31.30***
Stock prices/DR		
Trace Statistics	173.4*	17.02
Max-Eigen Statistics	191.9*	17.02
Stock prices/ER		
Trace Statistics	202.6*	40.85*
Max-Eigen Statistics	191.8*	40.85*
Stock prices/L2		
Trace Statistics	214.2*	20.29
Max-Eigen Statistics	231.9*	20.29

Source: Authors´calculations

*Note: *, ** and *** denote significance at the 1%, 5% and 10% levels.*

According to the VECM there are short-term deviations between the stock prices and the ROA and the ROE. The correction of short-term deviations should be occurred with probability 34% (ROA), 72% (ROE) and 83% (ER). The sign of the coefficient is, negative; this indicates that an increase in financial ratios has a negative impact on stock prices of selected metallurgical companies how the results in Table 10 determine.

Table 10: Results of the VECM – Metallurgical companies

CointEq1	-0.3489 (0.0123) [-28.3357]	**CointEq1**	-0.7254 (0.0198) [-36.6463]	**CointEq1**	-0.8373 (0.0186) [-44.8288]
PRICE (-1)	-0.1916 (0.0384) [-4.9793]	**PRICE (-1)**	0.0125 (0.0205) [0.6117]	**PRICE (-1)**	0.0776 (0.0156) [4.9782]
ROA (-1)	-16.9163 (3.3799) [-5.0049]	**ROE (-1)**	-3.1035 (0.3693) [-8.4033]	**ER (-1)**	-2.9330 (0.3768) [-7.7838]

Constant	-6.7344 (0.1809) [-37.2281]	**Constant**	-8.8650 (0.3329) [-26.6272]	**Constant**	-6.5843 (0.2089) [-31.5192]
R2	0.9094	**R2**	0.9307	**R2**	0.9716
Adj. R2	0.9073	**Adj. R2**	0.9290	**Adj. R2**	0.9706
F-statistic	427.0231	**F-statistic**	570.9875	**F-statistic**	958.7451

Source: Authors´calculations
Note: Standard errors are in ( ) and t-statistics is in [ ].

The findings for the chemical companies prove that it is not possible to confirm that the selected financial ratios belong to the economic fundamentals that affect the stock prices of chemical companies in the long-term, as Table 11 shows.

Table 11: Results of the Johansen test – Chemical companies

	r=0	r ≤1
Stock prices/ROA		
Trace Statistics	170.0*	10.22
Max-Eigen Statistics	173.5*	10.22
Stock prices/ROE		
Trace Statistics	85.49*	3.710
Max-Eigen Statistics	99.89*	3.710
Stock prices/FL		
Trace Statistics	46.81*	11.16
Max-Eigen Statistics	48.07*	11.16
Stock prices/DR		
Trace Statistics	17.91***	14.21
Max-Eigen Statistics	13.07	14.21
Stock prices/ER		
Trace Statistics	32.48*	8.054
Max-Eigen Statistics	35.02*	8.054
Stock prices/L2		
Trace Statistics	45.72*	14.23
Max-Eigen Statistics	43.73*	14.23

Source: Authors´calculations
*Note: *, ** and *** denote significance at the 1%, 5% and 10% levels.*

The panel regression is next method to examine which of selected financial ratios can affect stock prices of selected companies. The results for energy companies Table 12 shows. The coefficients of the ROE, the FL, the ER and the ER are statistically significant,

that means these financial ratios can have an impact on the stock prices of the energy companies. The influence of the ROE, the FL and the ER is, negative and the impact of the DR is positive. This means, the increase of the ROE, the FL and the ER should cause an decease of stock prices of energy companies and vice versa. The increase of the DR should cause an incease of the stock of energy companies and vice versa. The positive influence of the DR is in accordance with the theory, because debt financing can be cheaper then using of the own capital. The equation can be defined as:

Stock prices = 22.1051 + 19.0352 ROA – 0.3562 ROE – 0.1178 FL + 0.9653 L2 + 2.0523 DR
(0.0000) (0.0003) (0.2016) (0.0026) (0.0190) (0.2740)
– 81.0783 ER
(0.0006)

Table 12: The panel regression – Energy companies

Variables	Coefficients	Probability
Constant	22.1051*	0.0000
ROA	19.0352	0.0003
ROE	-0.3562*	0.2016
FL	-0.1178**	0.0026
L2	0.9653	0.0190
DR	2.0523*	0.2740
ER	-81.0783*	0.0006
Durbin-Watson statistics	2.1	

Source: Authors´calculations

*Note: *, ** and *** denote significance at the 1%, 5% and 10% levels.*

The findings for food firms Table 13 show. The coefficients of the ROA, the ROE, the FL, the L2 are statistically significant, that means these financial ratios can have an influence on the stock prices of the food companies. The impact of the ROA and the FL is, negative and the impact of the ROE and L2 is positive. This means, the increase of the ROE and the L2 should cause an incease of stock prices of food companies and vice versa. The increase of the ROA and the FL should cause an decrease of the stock of energy companies and vice versa. The positive influence of the ROE and L2 is consistent with the theory, and the negative impact of the FL is in accordance with the empricial literature. The equation can be defined as:

Stock prices = 0.4092 – 30.7909 ROA + 36.7686 ROE + 8.0002 FL + 0.3500 L2 + 0.1298 DR
(0.0130) (0.0000) (0.0000) (0.0001) (0.0012) (0.5337)
– 20.1706 ER
(0.0002)

Table 13: The panel regression – Food companies

Variable	Coefficients	Probability
Constant	0.4092**	0.0130
ROA	-30.7909*	0.0000
ROE	36.7686*	0.0000
FL	8.0002*	0.0001
L2	0.3500*	0.0012
DR	0.1298	0.5337
ER	-20.1706*	0.0002
Durbin-Watson statistics	2.04	

Source: Authors´calculations

*Note: *, ** and *** denote significance at the 1%, 5% and 10% levels.*

The results of the panel regression for metallurgical companies Table 14 shows. The coefficients of the ROA, the ROE, the FL, the L2 and the ER are statistically significant, that indicate these financial ratios can have an influence on the stock prices of the metallurgical firms. The impact of the ROA and the L2 is negative that indicate that an increase in this financial ratios can caused the decrease of stock prices and vice versa. And the influence of the ROE, the FL and the ER is positive that means increase of this financial ratios should cause an increase of the stock prices and vice versa. The equation of the panel regression can be defined as:

Stock prices = 13.3335 – 64.6899 ROA + 11.2304 ROE + 1.3022 FL – 2.9477 L2 –
(0.1758) (0.0000) (0.0000) (0.0000) (0.0349)
42.2584 DR + 16.8773 ER
(0.1175) (0.0000)

Table 14: The panel regression – Metallurgical companies

Variable	Coefficients	Probability
Constant	13.3335	0.1758
ROA	-64.6899*	0.0000
ROE	11.2304*	0.0000
FL	1.3022*	0.0000
L2	-2.9477**	0.0349
DR	-42.2584	0.1175
ER	16.8773*	0.0000
Durbin-Watson statistics	1.9	

Source: Authors´calculations

*Note: *, ** and *** denote significance at the 1%, 5% and 10% levels.*

The outcomes of the panel regression for chemical companies in Table 15 show that all coefficients are statistically insignificat. These results confirm there is not influence

of selected fiancial ratios to the stock prices of chemical companies. The findings are consistent with results of the Johansen cointegration test in Table 11. The equation of the panel regression can be defined as:

Stock prices = – 613.5333 + 612.9169 ROA – 12.5411 ROE + 27.4729 FL +99.7919 L2 +
(0.4442) (0.2755) (0.8711) (0.7245) (0.5218)
49.5414 DR + 1, 716.241 ER
(0.8168) (0.3975)

Table 15: The panel regression – Chemical companies

Variable	Coefficients	Probability
Constant	-613.5333	0.4442
ROA	612.9169	0.2755
ROE	-12.5411	0.8711
FL	27.4729	0.7245
L2	99.7919	0.5218
DR	49.5414	0.8168
ER	1,716.241	0.3975
Durbin-Watson statistics	1.97	

Source: Authors' calculations

*Note: *, ** and *** denote significance at the 1%, 5% and 10% levels.*

Conclusion

The objective of the paper was to analyze relationship between stock prices of food, energy, metallurgical, chemical companies and selected financial ratios. The Johansen cointegration test and the panel regression were used to examine long-term equilibrium relationship between the stock prices of the selected companies and the ROA, the ROE, the L2, the ER, the DR and the FL. The short-run dynamics of the long-term equilibrium relationship was examined using the Vector Error Correction Model (VECM). The results show statistically significant links that is consistent with Drummen and Zimmermann (1992) who confirm the importance of various market and sector factors to the stock prices.

According to the Johansen cointegration test the stock prices of energy firms were affected by the ROE and the FL, the stock prices of food companies and the stock prices of metallurgical firms were influenced by the ROA and the ROE. None of selected financial ratios had an impact on stock prices of chemical companies. The positive relationship was revailed between stock prices, the ROA and the ROE, that is consistent with Asteriou and Dimitropoulos (2009) who confirmed the positive effect of rentability to stock returns. The negative link can be detected with energy companies and metallurgical companies. These

results can be caused by the findings of negative value of the ROA and the ROE; or by their decreases in some years. The results are consistent with theory.

The influence of the FL to the stock prices is mainly negative, that is in the accordance with Muradoglu and Sivaprasad (2009) who showed the negative impact of the financial leverage to the stock returns. The positive effect is detected in some cases. These findings are caused by prevailing influence of positive leverage effect or negative leverage effect to the stock prices. Moreover the method of the panel regression confirmes the influence of the FL and the L2 on stock prices of food companies and the influence of the L2 on stock prices of metallurgical companies. Some of linkages were validated differently by the Johansen test and by the panel regression, specifically for energy companies. The difference of results can be related to the using of different methods, this fact is confirmed by empirical studies; e.g. Petcharabul and Romprasert (2014).

The results of the long-run equilibrium relationship were supplemented by using VECM estimations to analyze short-term dynamics. The results confirm the existence of the short-term deviations between the stock prices of the food and metallurgical firms, the ROA and the ROE and the stock prices of the energy companies and the FL.

According to the results it is not possible to make general conclusion. But the findings indicate mainly the impact of the rentability, the liquidity and the financial leverage to the selected stock prices of companies listed on the GPW.

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