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

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Abstract

Stock prices can be influenced by many factors; the macroeconomic factors, industrial specifics and company characteristics are three main cathegories. The object of this paper is to analyze relationship between the food, energy, metallurgical and chemical companies listed on the GPW over the 2006–2015 period. The Johansen cointegration test and the Vector Error Correction Model (VECM) are used to examine long-term and short-term relationship links. The findings indicate the prevailing impact of rentability to the selected stock prices of companies listed on the GPW.

Key words

Financial ratios, Cointegration, Poland, Industry, Stock exchange

Classification JEL

L60, M21, O52

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 cathegories 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 Polish Stock Exchange (Giełda Papierów Wartościowych w Warszawie, 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 insdustry 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) and the financial leverage (FL).

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 market capitalisation of selected companies present 10,11% of the market capitalisation of GPW, as Table no. 1 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 no. 1: Market capitalisation of selected companies

Capitalisation of GPW	1 340 bil. PLN
Capitalisation of seleted companies:	
Food companies	10,059 bil. PLN
Energy companies	101,216 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 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 financial ratios included are as follows: the return on assets (ROA) calculated as net income/total assets; the return on equity (ROE) calculated as net income/equity capital and financial leverage (FL) calculated as as total assets/total shareholders' equity. These time series are calculated using the financial statements of the companies and database Amadeus.

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.

Before the empirical estimations the descriptive statistics is presented in Table no. 2. 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 no. 2: Descriptive statisctics of stock prices

	Energy industry	Food industry	Metallurgical industry	Chemical industry
Mean	16.6375	1.91	14.2079	37.2691
Median	16.9700	1.68	9.7365	28.8778
Maximum	18.0025	2.96	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 Augmented Dickey-Fuller (ADF) 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):

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

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:

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

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.

3 Findings

At the beginning the correlation coefficients between the stock prices and financial ratios are demonstrated in Table no. 3. The correlation coefficients between stock prices and ROE are statistically significant in all cases. The stock prices of metallurgical and chemical companies demonstrate statistically significant coefficients with ROA. The stock prices of energy, food and chemical firms present statistically significant coefficients with FL.

Table no. 3: Correlation coefficients

	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*

Source: Authors´calculations

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

Further the results of 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 and LS, as Table no. 4 shows. The existence of the short-term deviation between the stock prices and LS was confirmed by VECM. According to the results the correction to the long-run equilibrium should be occured with probability 61%.

Table no. 4: 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*

Source: Authors´calculations

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

Two cointegratingvectors were revealed for two models and one cointegrating vector was detected for one model. According to the result it is possible to confirm that food stock prices were influenced by the ROA and ROE, as results in Table no. 5 show. The short-term deviations are detected between the stock prices and ROA and ROE. The results of the VECM show that the correction to the long-run equilibrium should be occured with probability 44% (ROA) and 53% (ROE).

Table no. 5: 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

Source: Authors´calculations

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

Then, for three models, two cointegrating vectors were revealed. The results in Table no. 6 present that stock prices of the metallurgical companies were affected by the ROA and ROE. The influence of the FL is very weak. According to the VECM there are short-term

deviations between the stock prices and ROA and ROE. The correction of short-term deviations should be occured with probability 34% (ROA) and 72% (ROE).

Table no. 6: 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***

Source: Authors´calculations

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

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 no. 7 shows.

Table no. 7: 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

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 was used to examine long-term equilibrium relationship between the stock prices of the selected companies and the ROA, ROE and FL. 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.

The stock prices of energy firms were affected by ROE and FL, the stock prices of food companies and the stock prices of metalurgical firms were influenced by ROA and ROE. None of selected financial ratios had an impact on stock prices of chemical companies. The positive relationship was revailed between stock prices, ROA and 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 the negative ROA and ROE in some years. The results are consistent with theory.

The influence of 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. 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, ROA and ROE and the stock prices of the energy companies and LS.

According to the results it is not possible to make general conclusion. But the findings indicate the prevailing impact of rentability to the selected stock prices of companies listed on the GPW.

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