

# CAN FINANCIAL RATIOS AFFECT THE STOCK PRICES OF SELECTED GERMAN COMPANIES?

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## Abstract

For several centuries, stock price changes have been the subject of research by analysts and investors due to the possibility of achieving capital gains. As shown by empirical research, different types of variables affect stock prices, including financial ratios. The subject of the research was to determine the possibility of the existence of a relationship between the stock prices of selected energy and German chemical companies and financial ratios. Selected financial ratios include return on assets (ROA), return on equity (ROE), and financial leverage (FP); liquidity ratios include current liquidity (L3) and networking capital to total assets ratio (NWCA). In the case of indebtedness ratios, these are the debt ratio (DR) and equity ratio (ER). The turnover of total assets (OTA) and turnover of receivables (OTP) were included in the group of activity ratios. The application of the GMM method shows the positive impact of debt ratio on the stock prices of energy companies, while a negative effect on the stock prices of chemical companies.

**Key words:** financial ratios, stock exchange, Germany, industry

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## Introduction

The current digital age is associated with electronic trading on the stock markets. Electronic markets are connected with benefits for investors as trading costs decrease and speed increases. At the same time, an audit trail is created that makes it easier to track brokers. However, low trading costs lead to excessive uninformed trading, which can significantly affect the stock market structure (Stoll, 2006). This fact could be related to the growing need for knowledge of information that is essential in explaining stock price movements. The empirical literature has provided evidence that macroeconomic and microeconomic factors are among the factors influencing stock prices. However, the influence of individual factors varies depending on the time period and geographical focus. This paper pays attention to

microeconomic variables and their connection with the stock market, specifically the German stock market.

The German stock market is the 13th largest globally by market capitalization; the larger stock markets in Europe are only Euronext and Nasdaq Nordic. Deutsche Börse AG's market capitalization of listed companies was 2.5 trillion USD in 2021. Proceeds of initial public offerings on the Deutsche Börse AG from 2018 to 2020 was in the health care sector in 5,746 mil. USD, in consumer goods sector in 4,991 mil. USD, in financials in 2,797 mil. USD, in the technology sector in 2,411 mil. USD, in industrials in 2,105 mil. USD, in consumer services in 666 mil. USD, in telecommunications 83 mil. USD and in sector oil and gas in 83 mil. USD. Deutsche Börse AG operates the Frankfurt Stock Exchange, and it can be said that the Frankfurt Stock Exchange forms the core of today's Deutsche Börse AG. Deutsche Börse AG has strengthened its competitive position through an electronic trading system, as electronic trading increases the efficiency of stock markets (Deutsche Börse Group, 2022; Statista, 2022; Stoll, 2006).

The research objective was to detect the possibility of the existence of a relationship between the stock prices of selected German energy and chemical companies and financial ratios. The first part presents a Review of the Literature, followed by Data and Methodology to achieve the objective. The third part is the Results and Discussion, and the paper concludes the Conclusion.

## **1 Review of Literature**

Many empirical studies examine the relationship between financial ratios and stock prices or stock returns. This section presents examples of some of these studies. (Avdalović & Milenković, 2017) focused on the analysis of ROA, ROE, EPS, book value, financial leverage, P/E, and M/B ratios on stock prices included in the BelexLine index in 2010 - 2014. The results showed the existence of linkages between variables, but the relationships show a different nature. The relationship between stock prices, the ROA, and stocks' book value appears to be the most significant. However, links were also established between stock prices and EPS, M/B, financial leverage and firm size indicators. Apart from (Avdalović & Milenković, 2017), the difference in ties across the researched fields is also evident (Ozlen, 2014). (Ozlen, 2014) focused on identifying the influence of microeconomic factors on the stock prices of companies traded on the Istanbul Stock Exchange. (Ozlen, 2014) used data from companies operating in the electrical industry, food industry, chemical industry, paper

industry, communications, mining and processing in 2000 - 2012. (Ozlen, 2014) concluded that a significant positive relationship between book value and market value of stocks is found in all sectors. The impact of the remaining variables (debt ratio, P/E ratio, total asset turnover ratio, net profit, L3) is already different within individual sectors.

(Dzikevičius & Šaranda, 2011) also evidence the significance of stock price indebtedness ratios. They used companies traded on the Lithuanian Stock Exchange and 20 financial ratios for 2007-2010 for the research. The results differ from company to company and, in some cases, are not in line with theoretical assumptions. It can be assumed that the situation is due to the lack of maturity of the Lithuanian stock market, as potential investors do not properly assess the performance of companies. Same as (Dzikevičius & Šaranda, 2011), also (Ligocká, 2018) focused on European markets analysis.

(Ligocká, 2018) analysed the influence of financial ratios ROA, ROE, debt ratio and equity ratio on the stock prices of selected energy, metallurgical and mechanical companies traded on the Swiss stock exchange. Data from nine companies in the period 2009 - 2017 were used. The results indicate that in selected companies, there are different links between the selected variables. Stock prices seem to reflect the specific financial characteristics of individual companies and are subsequently reflected in the value of stock prices in selected industries. The findings also suggest that the impact of financial ratios on stock prices may not be consistent with the theory; this is attributed to the negative development of variables or different values compared to other companies in the business sector. Similar to (Ligocká, 2018), (Dimitropoulos & Asteriou, 2009) also included profitability indicators in their research. (Dimitropoulos & Asteriou, 2009) examined the effect of selected financial ratios on the equity returns of 101 non-financial companies traded on the Athens Stock Exchange between 1995 and 2004. The results showed that working capital to total assets and ROS ratios negatively affect stock returns. At the same time, ROA and asset turnover positively impact stock returns.

## **2 Data and Methodology**

The research subject is the possible existence of a relationship between stock prices and financial ratios. Stock prices are an endogenous variable, while financial ratios are exogenous variables. Individual companies were divided into groups according to the business subject according to the classification of economic activities NACE. The requirement made the selection of all companies of listing the shares of individual companies by 2005 at the latest,

due to maintaining a sufficient time series to ensure the relevance of the results. The data set ends in 2018 due to the availability and complexity of data collection. The examined sample does not include companies that may be part of individual industries in terms of classification within individual stock exchanges but differs in the subject of business. It means, for example, companies engaged in research of technological progress in given areas, and companies providing logistics exclusively. Fourteen companies listed in Tab. 1 could be included in the research depending on the criteria.

**Tab. 1: Companies under examination**

Energy companies	Chemical companies
PNE Wind AG	Bayer AG NA
E.ON SE NA	Fuchs Petrolub SE O.N.
MVV Energie AG O.N.	K+S AG NA O.N.
RWE AG	Lanxess AG
KHD Humb.Wedag Ind. NA	Linde AG O.N.
7C Solarparken AG O.N.	SGL Carbon SE O.N.
Gelsenwasser AG	Centrotec Sustainable O.N

Source: Authors' processing.

Selected financial indicators included selected indicators of profitability, liquidity, activity and indebtedness. The return on assets (ROA), which reflects the company's overall efficiency, was included among the profitability indicators. ROA was calculated as profit after tax/total invested capital. Another indicator of profitability is the return on equity (ROE) expresses whether the investors' capital is reproduced with the appropriate intensity and corresponds to the risk of the investment. The ROE was calculated as profit after tax/equity. Profitability is also related to financial leverage (FP), which indicates how the return on equity will change if the capital structure changes. FP can be calculated as total assets/equity. Liquidity ratios included financial indicators, current liquidity (L3) and networking capital to total assets ratio (NWCA). L3 indicates whether the company would be able to satisfy its creditors if it converted all its current assets into cash at that time. L3 is measured as current assets/current liabilities. NWCA measures a company's ability to cover short-term financial liabilities by comparing its total current assets with total assets. NWCA can be calculated as (current assets - short-term liabilities)/total assets. In the case of indebtedness ratios, these are the debt ratio (DR) and equity ratio (ER). DR expresses the total indebtedness of the company and can be quantified as  $DR = \text{debt financing} / \text{total assets}$ . An ER indicates what part of the company's assets is financed using its own resources and can be calculated as  $ER = \text{equity} / \text{total assets}$ . Activity financial ratios included turnover of total assets (OTA) and

receivables (OTP) turnover. OTA indicates how many times total assets turn over the year and is calculated as sales/total assets. And OTP expresses how many times a year receivables are converted into cash. OTP can be calculated as sales/receivables (Kislingerová, 2001; Růčková, 2019).

For individual time series, the stationarity of time series was first verified using the Levin, Lin and Chu unit root test for panel data (Levin et al., 2002). Then the direction of the relationship between selected financial indicators and stock prices were determined using correlation analysis. The GMM method was used to determine whether selected financial ratios could contribute to the explanation of stock price movements. The relationship between analysed variables can be mathematically expressed as follows (Hall, 2005):

$$Y_{it} = \beta_0 + \beta_1 * \Delta Y_{it-1} + \beta_2 * X_{1it} + \beta_3 * X_{2it} + \dots + \beta_n * X_{nit} + \varepsilon_{it} \quad (1)$$

where  $Y_{it}$  presents endogenous dependent variable (stock prices),  $\beta_0$  is constant,  $\beta_1 \dots \beta_n$  demonstrate estimated coefficients and  $\varepsilon_{it}$  is the error term of the model. The exogenous variable presents  $\Delta Y_{it-1}$ , which means the delayed value of stock prices from the previous year, and factors  $X_1 \dots X_n$  represents analysed financial ratios. Variable  $t$  is the time period, and  $i$  present analysed sectors.

### 3 Results and Discussion

As results in Tab. 2 show, there was a statistically significant correlation coefficient between stock prices and financial ratios ROE, FP, DR, and L3 in energy companies' cases. There is an evident positive correlation between energy stock prices and ROE; an increase in ROE should positively affect stock prices. However, the negative correlation between financial ratio FP and energy companies signalize that increase in FP should be connected with a decrease in stock prices. The specifics of individual activities are evident for individual companies, which means that the magnitude of the leverage effect could be reflected in the correlation. Rising external financing could be related to falling stock prices. In the case of the L3 liquidity ratio and stock prices, a negative correlation coefficient is demonstrated, which means that the growth of the given indicator should be associated with a decline in stock prices. The negative correlation between stock prices and the L3 financial ratio could be related to the liquidity growth to a level that already signals an inefficient commitment of funds in current assets.

Then, a linear relationship is identified between stock prices and all analysed financial ratios except the OTA indicator for chemical companies. In the case of ROA, ROE and stock

prices, there is demonstrated a positive correlation. These resulting correlation coefficients suggest that an increase in the values of profitability indicators should be associated with an increase in stock prices. There is a negative correlation between the FP and the stock prices of chemical companies, which should mean that a decrease in stock prices would accompany the growth in the value of the FP. The negative correlation could be affected by the leverage effect associated with the growth of external financing; in the case of a negative correlation, there could also be a negative leverage effect. A negative correlation coefficient is found for DR indebtedness indicators and the stock prices of chemical companies, which suggests that the increase in the value of the DR indicator should be related to the decrease in stock prices. In contrast, a positive correlation coefficient is found for the ER indicator and the stock prices of chemical companies, which means that the increasing value of the use of equity as a source of financing should positively affect stock prices. It could mean that companies have too much external finance, and it is no longer appropriate to increase external sources of finance.

**Tab. 2: Correlation coefficients between stock prices and selected financial ratios**

Variables	Energy companies	Chemical companies
ROA	0.0894	0.7095*
ROE	0.3133*	0.7291*
FP	-0.2638**	-0.3031*
DR	-0.4545*	-0.4800*
ER	0.0095	0.3556*
L3	-0.2261**	-0.4440*
NWCA	-0.1145	-0.4801*
OTA	-0.1227	-0.0415
OTP	-0.1106	-0.3293*

Source: Authors' calculation. Note: \*, \*\*, \*\*\* represent statistical significance at the level of 1%, 5% and 10%.

In the case of L3 and NWCA liquidity ratios, a negative correlation coefficient is recorded. It means that an increase in the values of liquidity ratios should reduce the value of stock prices for chemical companies. The results may suggest that values above the recommended value could mean that funds in current assets are too much tied up. In contrast, growth in values within the recommended range of values typical of the industry could be perceived positively. A negative correlation is found between the OTA indicator and the share prices of chemical companies and the OTP indicator. Therefore, the growth of the given indicators should be accompanied by a decrease in the values of stock prices. The negative correlation between financial ratios of activity may affect the ability of managers to properly

manage asset items, prolong the collection of receivables and the possible impact on the liquidity of companies. The other correlation coefficients were not statistically significant, suggesting that the combined movements of the two variables were not strong enough.

Subsequently, a deeper investigation of the relationship between the analysed variables was made using the GMM method, as Tab. 3 presents. It is also necessary to note that the Sargan-Hansen test confirmed the robustness of all constructed models. The application of the GMM method has shown that the DR financial ratio appears to be important. The findings suggest that the DR ratio had a positive effect on the stock prices of energy companies while a negative impact on the stock prices of chemical companies. (Ozlen, 2014), (Ligocká, 2018) and (Dzikevičius & Šaranda, 2011) also found the DR financial ratio's positive and negative effects. The use of external financing could be perceived positively in relation to ROE. However, this statement does not always find support in developing financial ratios. It could be related to the lack of information needed for a proper data evaluation. While the negative link could be that the analysed chemical companies show a lower level of external financial resources, this means that there could be room for greater use of other external sources of financing and increasing the value of ROE.

**Tab. 3: The relationship between stock prices and selected financial ratios by method GMM**

Variables	Energy companies	Chemical companies
ROA	72.3653	7.3832
ROE	-97.7738	9.6041
FP	-4.6799	-7.7966
DR	33.7716**	-18.7298**
ER	-24.7496	-21.0812
L3	5.6141	15.8351
NWCA	-6.1387	17.913
OTA	0.3957	1.3265
OTP	-1.4683	-8.3213
J-statistic	3.9428	0.8007
Prob(J-statistic)	0.2676	0.6700

Source: Authors' calculation. Note: \*, \*\*, \*\*\* represent statistical significance at the level of 1%, 5% and 10%.

According to the GMM method, other financial indicators do not seem to be significant for developing stock prices. Evidence of links only in sporadic cases could reflect the fact that the specifics in the business activities of individual companies play an important role. Another reason can be seen, for example, in the perceived importance of individual

variables within the sector (Ozlen, 2014). Further, there could be involved the attractiveness of individual stocks, the level of competition in the industry, or what information the market considers important because stock prices can largely reflect many different types of information. Changes in other indicators also did not have to be assessed as significant and could have been absorbed by the market, as pointed out (Bhagat & Black, 2000).

## **Conclusion**

The research's subject was to determine the possibility of a relationship between the stock prices of selected energy and German chemical companies and financial ratios. As results of method GMM show, there is a relationship between stock prices of energy and German chemical companies and financial ratio DR. The achieved results are attributed to the specific situation of companies and the potential impact of their further use of external sources of financing. The relationship between the DR and stock prices could be related to the effect of debt on profitability. This interconnection of indicators and their development is usually crucial for companies' prospects, prosperity, and the resulting interest of potential investors.

However, the results showed no link between the other financial ratios analysed and stock prices. There could be more reason to explain this. Suppose I mention at least some of them. It may be the importance of individual financial ratios within the industry (Ozlen, 2014), the degree of competition in the industry, the attractiveness of individual stocks, and investor preferences. Moreover, these indicators might not be considered significant and could be absorbed by the market (Bhagat & Black, 2000). As stated (Bistrova et al., 2013), investors can evaluate information on the financial situation of companies completely individually and may not have sufficient information to evaluate the performance of companies properly.

As the results show, the links between stock prices and financial ratios may reflect many specificities. In addition, many factors constantly influence companies' business activities; therefore, examining the relationship between stock prices and corporate factors will be a good topic in the future.

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