

## Importance of Fundamental Analysis in the Market Valuation of the Medical Sector. Evidence from a Developed Stock Market

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### Abstract

*This study was conducted with the aim of showing the importance of fundamental analysis in valuing the companies in the medical sector, listed on Frankfurt Stock Exchange. The analysis period is 2008-2019 and the sample consists of 24 companies. As a result of the econometric modelling, it has emerged that fundamental analysis is a decisive one in the evolution of the market price of the companies listed on the German capital market, identifying indicators that have a positive and strong influence on the market value of companies, such as ROE and P/B ratio, and other indicators that exert a negative influence, such as indebtedness ratio and PER.*

**Key words:** fundamental analysis, efficient market hypothesis, fundamental indicators

**J.E.L. classification:** G11, G15, G32

### 1. Introduction

Fundamental analysis is one of the most well-known concepts in finance, alongside the efficient market hypothesis, time value of money or the CAPM model. It is based on the premise that share prices on the stock market are correlated with some fundamental factors, so, by analyzing the evolution of these factors, investors can make a profit above the market average.

Since the publication of the Security Analysis (Graham and Dodd, 1934), which is considered to be the cornerstone of fundamental analysis, until now, they have been both adherents of fundamental analysis, which validated its effectiveness, but also criticisms against its validity. The theory of efficient markets (Fama, 1965) still seems to be the main counter-argument of fundamental analysis. The efficient market hypothesis holds that when a new information about a company appears in the market it is immediately transposed in that company's share price. In this case, technical analysis, as well as fundamental analysis are useless in the attempt of estimating future prices, that would enable an investor to make a higher profit than that which might be obtained from a diversified portfolio for a long period of time (Malkiel, 2003). However, numerous empirical studies have shown that markets are not always efficient, while the presence of some anomalies such as the reversal effect or the effect of small firms (Banz, 1981) tend to confirm that opportunities to make a profit can exist even in these markets.

The main function of fundamental analysis is to determine the intrinsic value of a security on the basis of some fundamental indicators. The idea of determining the true value of a financial instrument stems in the fact that the market prices of these instruments do not fully correspond to the intrinsic value, and, in a world of uncertainty, this value is not known exactly. Because the opinions of market participants may differ, the market price of a share and its actual value may be different as well (Fama, 1965). Although, in theory, determining the intrinsic value seems to be a fairly accurate process, in practice it happens quite the opposite, since this value is determined not only by indicators whose size can be accurately calculated, but also by some market factors that are unknown to investors. Moreover, the intrinsic value may itself change over time as a consequence of new information emerging in the market. This information may be related to new research projects of a

company, changes in the management of the firm, the growth of industrial production, or any other factor that may affect the future course of the company (Fama, 1965), hence, the complexity of fundamental analysis.

More than 80 years after the publication of the second edition of Graham and Dodd's work (1940), some ideas still seem to be valid today. However, the efficient market hypothesis makes investors apprehensive about the effectiveness of fundamental analysis. Moreover, as a result of the technological development of capital markets, when financial information of firms is accessible to all users, the theory of efficient markets is still an actual topic of interest among researchers.

This study aims to highlight the importance of fundamental analysis in valuing companies in the medical industry, listed on Frankfurt Stock Exchange, one of the most developed European capital markets. The paper is structured in literature review, which highlights the main theoretical currents that considered the establishment of the market value of companies, and the case study, where we will quantify the existing linkage between different indicators of fundamental analysis and the market value of the companies in the selected sample.

## **2. Literature review**

### **2.1. The concept of fundamental analysis and its determinants**

The idea of fundamental analysis suggests that each financial instrument has an intrinsic value, which can be established by considering significant indicators such as dividends, profit, liquidity indicators, etc. In general, fundamental analysis is based on public information, accessible to all users, and investors using fundamental analysis argue that the stock prices adjust to new information emerging in the market with a certain delay (Lee, 1987).

Fundamental analysis becomes relevant with the advent of Graham and Dodd's work, first published in 1934, where intrinsic value is defined as that value based on real facts: dividends, assets, profit, etc. Long time ago, the intrinsic value was considered to be equal to the book value, but it was later proved that neither a company's profit nor the share price had anything to do with the book value (Graham and Dodd, 1940). The paper first published in 1934 supports the idea that, through a complete analysis of a company, the real price of the share can be determined, thus obtaining a profit above the market average (Isidore and Christie, 2019).

In general, fundamental analysis involves three basic elements: economic analysis, an analysis of the entire industry in which the analyzed company operates, and the analysis of the company itself. The three components of fundamental analysis are interconnected, and it is necessary to go through all the steps for an efficient analysis.

The idea behind the importance of economic analysis before investing in a firm is that, in a developing economy, the company is much more likely to thrive and possibly see an increase in the price of its shares (Isidore and Christie 2019). Following a study by Naik and Padhi (2012), it was found that there is a long-term link between the BSE Sensex index of the Indian capital market and three of the five macroeconomic variables studied. Thus, it was inferred that the stock market index has a positively correlation with the money supply and economic activity proxied by the industrial production index.

The second part of fundamental analysis consists of the analysis of the industry in which the firm operates, since even in a prosperous economy, some industries can have additional benefits as a result of some government actions. Therefore, an analysis of the industry the company comes from is necessary before an investment decision is made.

The last stage of fundamental analysis involves the analysis of the company, where factors such as the quality of management, financial indicators, competitive advantages, etc., are taken into account (Isidore and Christie, 2019). The financial information of a company can be extracted from the financial statements, and based on this information, fundamental financial ratios can be computed.

## 2.2. The efficient market hypothesis

Proponents of economic cycles theories argued that, following the evolution of economic variables for a certain period, one could foresee the future prospects of the entire economy (Bodie et al., 2020). Among the first to analyze these time series was Kendall (1953), who, after analyzing stock prices of listed companies, observed that they did not follow a specific direction, but rather evolved randomly. At the first appearance of this study the results seemed to suggest that the capital market is dominated by those "animal spirits" which cause an irrational behavior. Later, it was demonstrated that the random evolution of prices confirms the hypothesis of efficient markets (Bodie et al., 2020).

### **The idea of efficient markets and the randomness hypothesis**

The efficient market hypothesis is an important part of modern finance. Although empirical studies aimed at testing the hypothesis have not reached similar results, nevertheless, the idea itself is accepted by a large part of economists. In general, an efficient capital market is that market where stock prices reflect the fundamental information of the company. The theory of efficient markets supports the fact that, when a new information about a company appears in the market, it is immediately reflected in the share price of that company. Therefore, technical analysis and fundamental analysis as well are fruitless in determining the future prices of shares (Malkiel, 2003).

The theory of efficient markets is often linked with the random walk hypothesis, in the case of which future price developments are random deviations from previous prices. In fact, the random walk hypothesis suggests that, if the theory of efficient markets holds, then share prices in period  $n$  will only reflect the information of that period, thus being independent of the evolution of share prices in period  $n-1$  (Malkiel, 2003).

### **Limits of the efficient market hypothesis**

Shostak (1997) considers that the main problem arising when it comes to the efficient market theory is that it assumes that all participants in a market make rational decisions, which means that they all have the same expectations regarding the future evolution of stock prices. If this were true, then these financial instruments would no longer be traded, as the sale and purchase of these assets is in fact the result of different expectations of market participants regarding the future evolution of financial instruments. The second problem related to this theory, in Shostak's view (1997), is that the hypothesis holds that a buy-and-hold strategy has the same yield as any other strategy, so an entrepreneurial approach in capital markets would not make sense.

Over the years, several empirical studies have illustrated that investors could obtain profits above the market average even in developed capital markets. However, these studies are in contradiction with the theory of efficient markets, which is why the emergence of these possibilities to obtain above-average profits are called anomalies of efficient markets (Bodie et al., 2020).

The effect of small firms is one of the anomalies of efficient markets. This anomaly was first studied by Banz (1981), who analyzed the evolution of firms listed on the NYSE over a period of 40 years and observed that small firms had a higher profitability than large firms.

The reversal effect is another anomaly of efficient markets. According to this hypothesis, firms that in the past had a low yield tend to have a higher rate of return in the future than companies that previously performed well (Bodie et al., 2020). De Bondt and Thaler (1985) were among those who noticed this trend in the capital market. Following the analyses carried out by them, it was noticed that the companies that had a low performance until the formation of a portfolio that would include those firms, offered a higher rate of return in the next 36 months than the companies that in the past had high performances.

Empirical studies have shown that the efficient market hypothesis has enough problems to be considered entirely true. However, the probability of the emergence of strategies that offer the opportunity to make a profit above the average is quite small. Markets are efficient enough that the opportunity to win in these markets without having the information or skills superior to other investors is almost impossible.

### 2.3. Fundamental indicators and the market value of companies

Identifying a clear relationship between fundamental determinants of a company and its market value has been from the very beginning one of the most important issues in the field of investments. One of the first to notice the presence of this relationship is Collins (1957), who examined the factors that have the greatest influence on the share prices of ten banks from Wall Street. He identified several indicators that have influence on stock prices, among them are dividends, net profit, book value, etc. Another study conducted by Patell (1976) validates a positive relationship between earnings-per-share (EPS) and share prices. This was especially observed when firms voluntarily presented estimates of net earnings per share for future periods. Thus, it was observed that share prices increased more in the week in which these data were presented (in addition to the price increase due to the evolution of the market).

An indicator often used in fundamental analysis is dividend yield. Studies on the possibility of dividends to predict the future share price were realised by Campbell and Shiller (1988), as well as Fama and French (1988). In general, from these studies it was inferred that investors had a more significant gain if they invested in an index containing stocks that had higher dividend yields, than those investors who invested in an index with lower dividend payout ratio.

Earnings per share (EPS) is another indicator used by investors, which is widely used in financial analysis. Over the years, there have been several opinions about the ability of the EPS to predict the future value of a company. While some authors argue that earnings per share can be considered a relevant indicator in assessing the future value of a firm (Bustani et al., 2021), others believe that this indicator is not of much importance if analyzed separately (Khan et al., 2014). One of the reasons why EPS enjoys huge popularity among investors is that the profit, respectively, the profit per share can be used as a proxy to measure a company's capability to generate future cash flow flows (Besley et al., 2007). On the other hand, the value of a company depends both on future cash flows and on the risk associated with these cash-flows. Thus, trying to increase a company's profitability may not necessarily result in a higher price of that company as a result of a higher level of risk (Besley et al., 2007).

Another indicator that enjoys high popularity among investors is given by the ratio between the market price of the share and the earnings per share (PER). The price-to-earnings ratio has gained popularity among investors because it is easy to calculate, although interpretations of this ratio are different. One of the fundamental ideas behind this indicator states that investors should buy shares of those companies that have a low value of the PER coefficient, since these shares are considered to be cheaper, promising a higher rate of return in the future (Doblas et al., 2020). In opposition, some authors argue that a high price-to-earnings ratio denotes that this firm is set to grow considerably in the future, and these opportunities for the growth of the company result into a high value of PER.

Return on equity is another indicator used in fundamental analysis. Many consider that return on equity (hereinafter referred to as ROE) is one of the most important indicators in measuring the performance of a company. There are different opinions on the influence it has on a firm's market value. Following a study by Talamati et al. (2015), where banking companies listed on the Indonesian Stock Exchange were studied, they noted that ROE, taken individually, does not influence the firm's market value significantly.

Another useful indicator for investors is price-to-book value (hereinafter referred to as P/B). P/B indicator reflects the value that market participants assign to a company in relation to its book value. For most companies, the value of PB is bigger than 1, however, there are companies that have a value of this ratios lower than 1. A value of this indicator lower than 1 could mean that the firm is undervalued, thus being an opportunity to buy shares in that company. However, firms that have values of P/B below 1 may have some financial problems, which has caused the market to value the share price at its value. Among the first to study the influence of this indicator on share prices were Fama and French (1992), who analyzed the correlation between B/P ratio and the evolution of stock prices of non-financial companies. Following this study, it was concluded that the B/P indicator and the evolution of the market prices of these companies are positively correlated.

### 3. Case study and results

#### 3.1. The attractiveness of the medical sector in the German capital market

The econometric study in this paper aims to identify a correlation between the share prices of the companies in the medical sector in Germany and some indicators of fundamental analysis. The reason for choosing this sector lies in the favorable evolution of companies in the medical industry in the last ten years, but also in the potential for future growth.

The medical sector in Germany is of considerable interest among investors, being one of the largest economic sectors in the German economy, because this market occupies the first place in Europe in terms of market volume, number of patients and health service providers, according to GTAI (Germany Trade & Invest). Medical expenses in Germany amounted to over 400 billion euros in 2019, and in the last ten years this market has grown at an annual rate of 4.1% (Germany Trade & Invest).

Another reason why companies in the medical sector are important among investors is given by the evolution of medical technology in the last years. Germany is the largest market in Europe in terms of medical technology and the third in the world, with more than 1200 manufacturers of medical devices (German Trade and Invest, 2020). Table 1 is a summary of the medical equipment market in Germany for the period 2019-2020.

Table no. 1 Germany's medical equipment market 2019-2020 (USD billions)

	2019	2020
Market size	35	36,7
Local production	37,6	40,5
Imports	20,2	22,7
Exports	22,8	26,5
Imports from the U.S.	4,9	6,8

Source: International Trade Administration.

Even though this market has grown considerably in recent years, however, the potential for future growth is huge, and this should generate interest among investors. Among the factors that may influence the growth of this market in the coming years are:

- Ageing society – by 2035, 24 million people will be over the age of 65, representing 31% of Germany's population;
- Addiction to healthcare – this is supposed to increase from 3.5 million people (2017) to 4 million by 2030;
- Digitalization – digitization and safe transmission of data will increase the quality of medical services, at the same time offering the possibility of providing these services at lower costs (Germany Trade and Invest, 2020).

#### 3.2. Econometric study

##### Data and methodology

In our study data grouping method was panel data type, in order to identify a link between share prices, return on equity (ROE), price-to-book value (PB), debt-to-equity ratio (DE), earnings per share (EPS), price-to-earnings ratio (PER), and dividend yield (DIVY). The sample analyzed is made up of 24 companies from the medical sector, listed on Frankfurt Stock Exchange. The analysis period is 2008-2019. The share price was considered as a dependent variable, and ROE, PB, DE, EPS, PER, DIVY are independent variables. We have started our econometric analysis by estimating an ordinary least squares (OLS) regression. The level of significance used to accept or reject the null hypothesis is 10%. The software used for regression analysis is EViews 12 Student Version. The basic econometric model that we started our analysis from is as follows:

$$y_{it} = \alpha + X'_{it}\beta + \varepsilon_{it} \quad (1)$$

where:

$y_{it}$  - dependent variable;

$i=1,2,... N$  (analyzed indicators);

$t=1,2,... T$  (time)

$X'_{it}$  - vector of explanatory variables (regressors);

$\alpha$  and  $\beta$  - the parameters of the model.

The econometric model used in this study has six independent variables, as mentioned earlier, and the structural model of the initial regression is presented below:

$$Price_{i,t} = \alpha + \beta_1 ROE_{i,t} + \beta_2 PB_{i,t} + \beta_3 DE_{i,t} + \beta_4 EPS_{i,t} + \beta_5 PER_{i,t} + \beta_6 DIVY_{i,t} + \varepsilon_{i,t} \quad (2)$$

The data for the 24 companies were collected from the koyfin.com website, as well as from the boerse-frankfurt.de, and the calculation of the six variables is presented in Table 2.

Table no. 2 Fundamental analysis indicators

Indicator	Formula
Dividend yield (DIVY)	$DIVY = \frac{\text{Dividend per share}}{\text{Share price}}$
Earnings per share (EPS)	$EPS = \frac{\text{Net income} - \text{Preferred dividends}}{\text{Number of shares}}$
Price-to-earnings ratio (PER)	$PER = \frac{\text{Share price}}{\text{Earnings per share}}$
Return on equity (ROE)	$ROE = \frac{\text{Net income}}{\text{Book value of equity}}$
Price-to-book value (P/B)	$P/B = \frac{\text{Share price}}{\text{Book value per share}}$
Debt-to-equity ratio (D/E)	$D/E = \frac{\text{Total debt (interest bearing)}}{\text{Book value of equity}}$

Source: realized by authors

Descriptive statistics for the data can be depicted in the table below (Table 3).

Table no. 3 Descriptive statistics

	PRICE	ROE	PB	DE	EPS	PER	DIVY
Mean	27.21282	-0.026661	3.174470	0.843982	0.304767	13.71134	0.020523
Median	15.90000	0.058800	2.100000	0.310000	0.500000	13.94444	0.009857
Maximum	175.0000	4.638900	75.17073	64.71100	11.33000	650.0000	0.427692
Minimum	0.399000	-2.881800	-19.57407	-2.845000	-19.40000	-547.3571	0.000000
Std. Dev.	29.50844	0.564302	6.439153	4.112699	3.151458	70.73146	0.046519
Skewness	1.577820	2.638396	6.274926	13.72443	-2.558874	2.237644	5.366454
Kurtosis	5.527412	30.72801	66.16830	210.6587	17.19346	51.62819	38.64971
Observations	279	279	279	279	279	279	279

Source: realized by authors

### Results and interpretation

Following the regression analysis of the 24 companies, the regression coefficients for the six independent variables were determined. The proposed regression method was the Generalized Method of Moments (GMM). The GMM method is recommended in the empirical literature, being designed for situations when:

- the panel is a "small T, large N" panel (we have a rather small time period, of 12 years and a larger number of companies);

- There is a linear functional relationship;
- The dependent variable is dynamic, depending on its own past realizations (the closing price depends on its previous value);
- The independent variables are not strictly exogenous, being correlated with past and possibly current error.

On the other hand, GMM controls for the endogeneity of the lagged dependent variable, omitted variable bias and unobserved panel heterogeneity. Consequently, using GMM estimation method conducts us to more robust results.

The econometric estimation, using GMM, can be viewed in the Table 4. Sargan test proves that the instruments used in the GMM estimation are valid. We can therefore analyze the results.

According to the Table 3, the results regarding the influence of the dividend yield (DIVY) and the influence of Earning per share (EPS) are statistically insignificant. In the case of the DIVY indicator, the explanation could be given by the big number of companies which have not paid any dividends in this period. According to the data, 10 of the 24 companies did not pay dividends in the period of analysis, while only 8 companies distributed dividends each year for the period 2008-2019. Regarding the EPS indicator, its lack of significance could be given by the fact that many companies in the sample had losses over several consecutive years, losses that materialized in negative values of the EPS indicator.

Table no. 4 Results of the GMM econometric modelling

Dependent Variable: PRET				
Method: Panel Generalized Method of Moments				
Transformation: First Differences				
Sample (adjusted): 2010 2019				
Periods included: 10				
Cross-sections included: 24				
Total panel (unbalanced) observations: 231				
White period (period correlation) instrument weighting matrix				
White period (cross-section cluster) standard errors & covariance (d.f. corrected)				
Standard error and t-statistic probabilities adjusted for clustering				
Instrument specification: @DYN(PRET,-2) @DYN(PER,-2)				
Constant added to instrument list				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
PRET(-1)	0.847008	0.022100	38.32644	0.0000
ROE	9.163386	2.674787	3.425838	0.0023
PB	0.528688	0.141462	3.737320	0.0011
DE	-1.333393	0.741907	-1.797251	0.0854
EPS	0.121926	0.130952	0.931077	0.3615
PER	-0.021377	0.008443	-2.531941	0.0186
DIVY	42.50439	33.79485	1.257718	0.2211
Effects Specification				
Cross-section fixed (first differences)				
Mean dependent var	2.613459	S.D. dependent var	12.02641	
S.E. of regression	15.76205	Sum squared resid	55651.08	
J-statistic	13.65474	Instrument rank	24	
Prob(J-statistic)	0.691373			

Source: realized by authors

As a result of the econometric modelling, it was inferred that ROE has the biggest impact on the evolution of share prices, having a coefficient of 9.16, which means that an increase of ROE by 1% would cause an increase in the share price of listed companies by 9.16 euros. This result converges to other results obtained by other empirical and theoretical studies, where it is shown that ROE directly influences the growth rate of a company, which in turn influences its market price (Bodie et al., 2020). In the study conducted by Lusiana (2020), it was shown that ROE has a positive effect on the share prices of Indonesian food companies.

As for the influence of the PB indicator on the market value of companies, things seem to be more complicated in reality. Looking strictly at the results of the regression, a coefficient of 0.53 suggests that, although to a lesser extent, PB positively influences share prices, which means that higher values of this indicator would result in higher share prices of listed companies. However, our results are not in line with economic theory, because adherents of fundamental analysis argue that those companies that have the lowest values of the PB indicator have a better chance of growth. Contrary to the results of this study, Fama and French (1992) came to the conclusion that those companies that had the lowest values of the PB indicator offered a higher rate of monthly return than the companies that had high values of the PB.

The third indicator in this study, this time having a negative influence on the market price of shares, is the ratio of debt to equity, in other words the indebtedness ratio of the company (DE). According to the results, a coefficient of -1.33 suggests that an increase in the DE indicator causes an evolution in the opposite direction of the share prices of companies. Thus, increasing a company's indebtedness would have a negative effect on the market value of this firm. One of the reasons why the DE indicator has a negative coefficient could be given by the higher risk of bankruptcy, specific for companies with a high degree of indebtedness. Therefore, companies that have a high level of debt are considered to be risky, and this can have negative effects on the market value. However, there are also studies that demonstrate that DE has a positive influence on the market value of listed companies. Bhandari (1988) was among the first to identify that the DE indicator has a positive influence on the companies' share prices. Kamar (2017), as in the previous study, also identifies a positive influence of the DE indicator on the market value of companies, although this time the influence is much weaker.

Regarding the impact that PER has on the market value of companies, the corresponding coefficient is of -0.02, meaning that the PER indicator negatively influences the share prices of the analyzed firms. Respectively, an increase in the PER indicator should generate a decrease in the share price, but to a lesser extent. Our results are in line with the economic theory, which point out to the PER indicator as a signal for buying/selling shares. In general, a higher PER is associated with an overvaluation of a share, giving a selling signal, while a lower PER indicates that the share is undervalued and consequently a buying recommendation. In other words, an increase in the PER should be negatively associated with the market price, giving the increasing volume of that share supply on the stock market.

Overall, we can say that there are fundamental analysis indicators that influence the market price of the analyzed companies, even in a developed capital market such as the German market.

#### **4. Conclusions**

Based on the results of the econometric modelling, we can conclude that some indicators used in fundamental analysis can influence indeed the market value of a company. It was revealed that ROE has the greatest influence on the market price of shares, having a coefficient of 9.16. Other indicators such as PB, have a positive but less stronger influence on the market price. On the other hand, DE negatively influences the market value of firms, having a regression coefficient of -1.33. As mentioned before, one of the explanations of the inverse link between the degree of indebtedness and the share price would be the high risk that companies with a high level of indebtedness present, which translates into a lower market value. PER influences negatively the market value of the companies, an increase of this indicator leading to a decrease in the market price.

Concluding, we can say that some of the analyzed indicators can be used by investors to substantiate some ideas on the future evolution of stock prices. However, we must not forget that the analysis in the given study was carried out on the basis of historical data, and trying to predict future prices based on past data is barely the best option. Moreover, the data used in this study can be accessed by all investors at no cost or at minimal cost, and, according to the theory of efficient markets, we would expect that this data would have long been reflected in stock prices. The present study could be extended by taking into account other sectors of activity in the German capital market, in order to carry out a comparative analysis.

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