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## ARE POLISH HEALTHCARE STOCKS DEFENSIVE?

**Abstract.** The main aim of this article is to verify whether the companies operating in Polish healthcare industry could be included into the group of so called defensive companies. The value of such companies during recession does not decline or the declines are significantly lower compared to the major stock indexes.

The analysis carried out in the article is conducted amongst companies from healthcare sector listed on the Warsaw Stock Exchange (WSE). In the article an analysis is presented comparing risk ratios of defensive stocks and whole stock market such as beta coefficient ( $\beta$ ). The analysis is based on daily data intervals from the period 2012–2014.

The article is based on the assumption that Polish healthcare industry companies may be portrayed as defensive and the results of the study suggest to support this point of view. Therefore, the stocks of such companies can be considered by investors as interesting assets for building diversified portfolios and working on investment strategies.

**Keywords:** defensive stocks, aggressive stocks, cyclical stocks, non-cyclical stocks, healthcare companies

**JEL:** G11

### 1. INTRODUCTION

The investment process as far as capital market is concerned tends to be complicated due to instabilities occurring in international economy. That is why investors are looking for effective investment strategies that will enable them to earn money not only in the times of overall prosperity but also during the time of economic slowdowns. One of the strategies that can be applied in such times is based on so called defensive stocks. This article presents the example of Polish healthcare sector as a branch that can be portrayed as defensive-type industry.

The main aim of this article is to verify whether the stocks of companies operating in Polish healthcare sector could be perceived as defensive. The article is based on the hypothesis that Polish companies from healthcare industry are resistant to economic turmoil associated with the occurrence of financial crises and that their stocks can be portrayed as defensive.

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The analysis contains a comparison of risk ratios of particular healthcare companies and the whole of the Polish stock market. The ratios applied for such a comparative analysis are beta coefficients representing non-diversifiable risk.

## **2. MAIN CHARACTERISTICS OF DEFENSIVE STOCKS**

Defensive or non-cyclical stocks can perform relatively well in times of uncertainty. They stay in the contrary to offensive stocks or cyclical stocks which perform well when stock markets are favorable (Lewis 2004: 38). Stocks of offensive companies are also called aggressive stocks (Pietrzykowski 2008: 116–124).

It is believed that profits generated by defensive companies with high level of certainty do not fall down as fast as profits of offensive companies or even do not fall down at all during economic breakdown. Defensive stocks are characterized by relatively low risk levels. Stock prices of offensive companies are strictly connected to the overall economic situation. During times of prosperity they bring investors relatively high rate of returns usually in a relatively short period of time. Unfortunately in times of economic breakdowns their stock prices fall down really fast (Majewski 2008: 18–31). The situation of investors possessing defensive stocks should be relatively better as compared to the situation of the whole stock market (Gęsicki 2009). On the other hand, some analyses claim that possessing defensive-type stocks in one's portfolio is not very profitable (Mahan 1965: 69–78).

Defensive sectors include companies from such branches as: pharmacy, healthcare, gold trade, public-benefit (including gas or water providers), food, energy or telecommunication. Usually there is high demand for the products and services offered by such sectors. By contrast technology sector may be treated as an offensive one (Lewis 2004: 38; Zbiejczik 2013; Zatoryb 2012; Gęsicki 2009; Chudzyńska-Stępień 2012).

Usually defensive sectors produce and sell products or services that consumers must buy no matter what. Among such sectors are for example medicine and food industry (Wang 2010).

## **3. ANALYSIS OF DEFENSIVE STOCKS IN POLAND**

There is little scientific literature available on the issues connected with defensive and offensive stocks. However, in business and market practice the problem is connected with cyclical and non-cyclical stocks and it is thoroughly discussed.

For the Polish market scientific evaluations of defensive companies has been conducted, for example, by Czyżycki (2012) – in the article the author establishes that telecommunication companies in Poland might be treated as defensive. Another example of analysis dedicated to defensive and cyclic stocks has been presented by Łon (2006). In the article the author using quantitative methods presents two groups of shares – cyclical and defensive ones – quoted on the Warsaw Stock Exchange. As a criterion for such division the author uses interrelations between economic situation on the exchange market at a given period of time and the level of economic activity in the following period. Some considerations in this matter have been given also by Majewski (2008) and Pietrzykowski (2008) – in the parts of the articles dedicated to the defensive stocks the authors try to classify some of the analyzed companies as defensive ones. These empirical analyses indicate that such simple division – using the simple features of defensive companies discussed earlier in the article – might be rather unclear. For example Majewski (2008) in his study that included companies from Polish market quoted on the Warsaw Stock Exchange classified some energy stocks (KGHM, PGNiG) as defensive. One of the biggest Polish banks (PKO) is also in this group. On the other hand, in the same study, other big Polish banks (ING, Pekao, BZWBK) are described as offensive companies and are found in the same group as a big media corporation (TVN) and an I.T. company (Prokom). Classifying stocks from the WSE as cyclic or non-cyclic was also one of the points of the analysis conducted by Osińska and Stempińska (2003). In some cases the authors were able to make such classification but in most cases obtaining clear results was impossible. Feder-Sempach (2011) in the study dedicated to risk analysis of the stocks from WIG20 (stock market index of the twenty largest companies on the WSE) in the period 2000–2008 and yearly sub-periods also tried to classify the stocks as defensive or aggressive. However, the overall results when analyzing yearly sub-periods were rather unclear in most cases and the only company whose shares could have been classified without a doubt as defensive was PGNiG. While analyzing beta coefficients in the whole period 2000–2008 it was much easier to make such classification. It turned out that most companies can be classified as aggressive.

There have also been many analyses conducted by business practitioners. Moreover, a special indicator showing the situation of defensive companies in Poland was constructed for a popular Polish business magazine “Puls Biznesu” (Wierciszewski 2011).

Some authors analyzing the stock market in Poland also suggest that a proper definition of Polish defensive sector according to particular economy branches can be problematic. (Gęsiński 2009; Chudzyńska-Stępień 2012).

#### 4. HEALTHCARE COMPANIES AND THEIR NON-CYCLICAL FEATURES

Healthcare companies are characterized by some special attributes that make them resistant to economy fluctuations; and that is why they can be treated as defensive companies.

Lourens Coetzee – an investment professional at Marriott – discusses some defensive companies, giving the example of Life Healthcare (a company that has lately expanded into Poland and South Africa). Some of the defensive qualities of healthcare companies are as follows (Coetzee 2014: 46–47):

- Aging population – this is a very important factor for healthcare services.
- Price growth – usually, in case of healthcare companies, price growth is higher than consumer price inflation.
- Growing number of people using medical aid plans – this factor is especially important in case of private healthcare providers.

Another very important factor that constitutes the strength of healthcare providers as non-cyclical companies is the fact that the demand for healthcare is always much higher than the supply. By contrast it is worth to point out that some government regulations and medical staff shortages may be treated as threats to this sector (Chetty, Rossouw 2015: 49).

#### 5. METHODOLOGY OF THE ANALYSIS

To analyze whether the company may be portrayed as defensive or offensive a beta coefficient ( $\beta$ ) is usually used, which is a measure of individual security's volatility in comparison to overall market return (Babcock 1972: 699–702). The beta coefficient is calculated according to the following formula:

$$\beta_i = \frac{\text{cov}(R_i, R_p)}{\text{var}(R_p)}$$

The beta coefficient is most often portrayed as a measure of the systematic risk of the analyzed security in comparison to the market index. It represents sensitivity of a particular stock to overall market movement. The systematic risk in terms of covariance of the analyzed security's return with the market portfolio's return is presented in the numerator. This relationship is standardized by dividing it by variance of market portfolio's return – presented in the denominator (Pogou, Solnik 1974: 917–944; Sarker 2013: 22–27). Systematic

risk – in contrary to specific risk – cannot be eliminated by methods of portfolio diversification. The beta coefficient gives clear information to the investors on the percentage change in prices of the analyzed stock, if there is 1% change in the prices of market index (Letkowski 2013: 75–87). Commonly the beta coefficient is based on historical data on the realized market returns and a specific stock's returns in a specific time period. Monthly, weekly or daily data can be used to calculate the value of the beta coefficient. As far as the time period is concerned it should be appropriate to ignore short-term market fluctuations as well as to indicate the stock price change risk (Radović, Vasiljević 2012: 423–441). Beta coefficient may be estimated by the analyst in a subjective manner (Byrka-Kita, Kisielewska 2002: 81–91).

However, there are also suggestions that calculating just the beta ratio is not enough and that a better risk measure that should also be incorporated into such kind of analysis is the ratio calculated according to Blume's beta correction. It is believed that this ratio gives better future approximations and it is generally used more often than the simple beta coefficient (Czyżycki 2012: 81–89). The Blume estimator includes an implicit forecast of change as well as a past beta estimation (Lally 1998: 183–198). Another popular technique used for estimating beta coefficient is Vasicek's method (Vasicek 1973: 1233–1239). However, Blume's and Vasicek's techniques are mainly used to estimate future beta coefficients (Sarker 2013: 22–27).

Obviously some problems might occur while estimating beta coefficient.

First of all some authors suggest that beta coefficients are sensitive to the sampling intervals, which is untypical of efficient markets (Pogou, Solnik 1974: 917–944). Blume (1971) indicates that beta stability is higher in the case of combined portfolios of shares than in case of particular stocks. The other problem that might have a significant influence on the beta estimation is so called "size effect" of the company. Banz (1981) points out that smaller companies have higher risk adjusted returns in comparison to larger companies. There are also other analyses focused on the "size effect" (Roll 1981: 879–888; Reinganum 1982: 27–35). Some authors also conduct analyses that take into account both these aspects. (Perron, Chun, Vodounou 2013: 42–62). Another very important problem in efficient beta coefficient estimation might be the occurrence of the outliers (Theodossiou, Theodossiou 2014: 153–171). What is more, the size of the analyzed sample of companies might also have a significant impact on the beta coefficient estimation. Using small samples can lead to large estimation error (SFG Consulting 2013). Novak and Petr (2010) in their study indicate that beta coefficient is unrelated as far as cross-sectional stock returns are analyzed. There are even suggestions that beta coefficient estimated in a simple classical way should not be portrayed as a risk measure characteristics (Mazurkiewicz 2002: 393–401).

Due to so many problems occurring while estimating beta coefficient many analyses of how to calculate  $\beta$  properly have been undertaken (Chan and Lakonishok 1992: 265–282). Probably the most popular works on how to estimate and interpret beta coefficients correctly have been written by Blume (1971: 1–10; 1975: 785–795; 1979: 265–267) and Vasicek (1973: 1233–1239) – mentioned earlier in the article. However, they focus mainly on estimating future beta coefficients not the actual ones. Some authors suggest that there might be no significant differences between Vasicek's and Blume's methods and that the forecasted values of beta coefficients, using these methods, are significantly different from the actual beta coefficients (Sarker 2013: 22–27). Klemkosky and Martin (1975) have proven that using Blume's and Vasicek's corrections have a positive impact on the quality of the forecasts of future beta coefficients. Some other ways of beta coefficient estimation are also worth mentioning – for example Tarczyński (2009) presented an interesting attitude towards better estimation of beta coefficient aimed at increasing chances of making successful investment decisions. Another example is mentioned by Jajuga and Jajuga (2007), where the authors indicate that beta coefficient might often be estimated as a weight average of two components: beta coefficient estimated on the basis of historical data and beta coefficient also including other types of information (Jajuga, Jajuga 2007: 240).

Using regression models to estimate beta coefficient is justified when all assumptions of the ordinary least square (OLS) method are met. Unfortunately in case of data coming from financial markets such situations occur rarely (Brzeszczyński 2005: 49–53). When the assumptions of the OLS are not met the quality of beta estimation performed in the classical way might be doubtful (Tarczyński, Witkowska, Kompa 2013: 117). The problem of heteroskedasticity might occur while estimating beta coefficient. In such case it is advised to use ARCH or GARCH model for beta estimation. These models are used more and more often in the process of beta estimation (Gajdka, Brzeszczyński 2007: 73–81). Among some other methods used for  $\beta$  estimation, other than linear regression, one can also distinguish nonparametric methods or Variable Mean Response Model (VMR) (Tarczyński, Witkowska, Kompa 2013: 52).

Due to the fact that this study is – according to the author's knowledge – the first study in Poland aimed at classifying healthcare companies as defensive, and as a result can be treated as an initial study in this matter, a simple, classical beta coefficient is used. Using such a ratio may be characterized by some errors, however, due to its simplicity, it is still the most popular way of beta estimation (Feder-Sempach 2011: 103; Byrka-Kita, Kisielewska 2002: 81–91).

In case of beta coefficient the following classification can be used (Radović, Vasiljević 2012: 423–441; Letkowski 2013: 75–87):

- $\beta > 1$  – the stock of such a company may be portrayed as aggressive, which means that its price changes faster than the price of market index;

- $0 < \beta < 1$  – the stock of such a company may be portrayed as defensive, which means that its price changes slower than the price of market index;
- $\beta = 1$  – the stock of such a company is affected by exactly the same price changes as a market index;
- $\beta = 0$  – the price changes of such a stock do not respond to changes in prices of a market index at all;
- $\beta < 0$  – the changes in stock prices of such a company are in opposition to price changes of a market index.

Generally in times of prosperity it is advised to buy stocks featured by the highest possible  $\beta$  whereas in times of recession it is better to make an investment in shares featured by  $\beta$  lower than zero (Tarczyński, Witkowska, Kompa 2013: 37).

The following analysis is based on daily data from the 2012–2014 period. Financial data used in the analysis was taken from the website of a Polish broker's offices (Dom Maklerski Banku Ochrony Środowiska SA, bossa.pl). Daily rates of return are calculated according to the following formula, based on closing prices of shares:

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}}$$

Companies quoted on the Warsaw Stock Exchange, classified as healthcare companies according to one of the most popular Polish financial portals – Money.pl. have been chosen for this analysis.

Table 1. Polish healthcare companies listed on the Warsaw Stock Exchange

Name	First listing on the WSE	Main activity
Biomed SA	2011.07.29	production of biotechnological medicines and pharmaceutical products
Braster SA	2012.12.20	production of medical and dental equipment, instruments and devices
Mabion SA	2010.08.10	production and implementation of new biotech and bio-similar drugs
Selvita SA	2011.07.14	scientific research and experimental development of biotechnology
Synektik SA	2011.08.09	manufacturing of irradiation, electro-medical and electrotherapeutic equipment
Voxel SA	2011.10.11	medical centers providing highly specialized services in the field of radiology

Source: Author's own elaboration on the basis of <http://www.money.pl/> [Access 07.07.2015].

Due to the fact that the analyzed period is 2012–2014 Braster is excluded from further analysis. It was firstly listed on the WSE at the end of 2012, so there would be significant lacks in financial data for the solid assessment of the company in comparison to the other ones as far as the beta coefficient is concerned.

An overall beta coefficient for the whole period of 2012–2014 is estimated for each of the analyzed companies. What is more, an estimation of the beta coefficient in yearly sub-periods is also given. Such calculations allow for assessing if the healthcare companies listed on the WSE might be portrayed as defensive or not.

Warsaw Stock Exchange Index – WIG (*Warszawski Indeks Giełdowy*) is used as the market index. Warsaw Stock Exchange Index is one of the major stock indexes in Poland. It covers more than 350 companies listed on the WSE. It has been the first Polish stock market index trading since April 1991. The WIG is a total return index, which means that for its calculation both the share price included in the index as well as the income from dividends or rights issues are taken into account. Currently the WIG index includes all companies listed on the main market of the Warsaw Stock Exchange which meet basic criteria for participation in the indexes.

As mentioned earlier, beta coefficient should be analyzed in different types of market situations. So, it is worth analyzing the stock market behavior – represented by the WIG – in the analyzed period of 2012–2014. The graph below shows the situation as far as the Warsaw Stock Exchange Index is concerned:

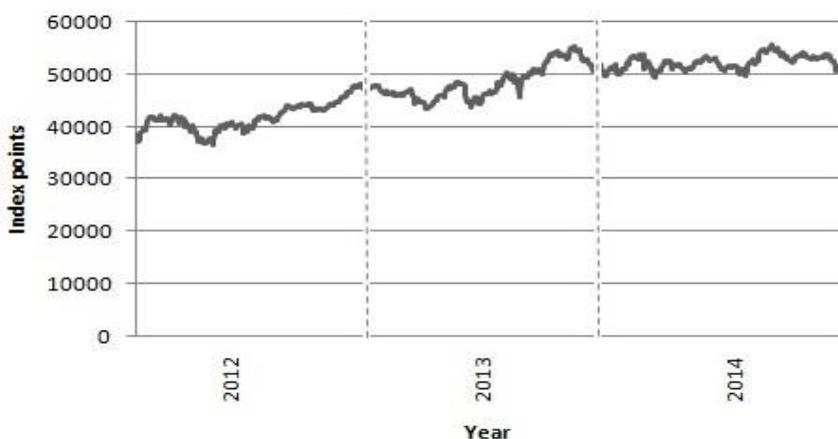


Figure 1. Price movements of WIG in the years 2012–2014

Source: Author's own elaboration on data collected from <http://bossa.pl/> [Access 10.07.2015].

Figure 1 shows that in years 2012–2013 there was a moderate market growth whereas in year 2014 market consolidation was observed. So, as far as trend analysis is concerned there is lack of stock market declines or in other words, we have a bearish market movement. Unfortunately due to the fact that Polish healthcare companies have been publicly quoted for a short period of time (Table 1) it is impossible to conduct analysis for a longer period of time that would also take a downward trend into account. However, in the analyzed period there are at least two different types of market fluctuations, so generally it is a positive phenomenon for the beta coefficients' calculations.

## 6. RESULTS

The results of calculations of the beta coefficients in case of the analyzed companies are presented below:

Table 2. Beta coefficients for the analyzed companies in the period 2012–2014 and in yearly sub-periods

Period	Name of the company				
	Biomed SA	Mabion SA	Selvita SA	Synektik SA	Voxel SA
$\beta$ 2012	-0.2241302	0.1870249	0.6706117	0.2429666	1.4528436
$\beta$ 2013	-0.1010751	0.5262520	0.2873805	0.2917416	0.2213298
$\beta$ 2014	1.3290336	1.1021235	0.2523902	0.4476107	0.4807039
$\beta$ 2012–2014	0.2666439	0.5724272	0.3991015	0.3179638	0.7376399

Source: Author's own elaboration on data collected from <http://bossa.pl/> [Access 10.07.2015].

As it is visible for each of the analyzed companies from the healthcare sector the values of the beta coefficients throughout the analyzed period of 2012–2014 are lower than 1, which allows us to make an assessment that Polish healthcare companies may be portrayed as defensive. This means that the research hypothesis can be verified in a positive way and that the companies' price changes are slower in comparison to the WIG ones.

However, detailed analysis of  $\beta$  values in the sub-periods brings some further insights.

In some cases the beta coefficients are higher than 1, which may suggest that in some sub-periods some companies behaved as if they had been aggressive companies. This phenomenon might be explained by the fact that healthcare industry is a very wide sector which includes many companies dependent on government activities; slow growers as well as companies involved in

biotechnologies which may have high growth potential (Whitfield 2015). Such explanation can especially be relevant for Biomed and Mabion which achieved slightly higher than 1 beta coefficients in 2014 sub-period. In case of Voxel, a higher than 1 beta coefficient might be explained by the fact that this company was listed for the first time on the Warsaw Stock Exchange at the end of 2011. So, the year 2012 was the very first year when the company was publicly quoted and it might be that during this time the company realized its high growth potential.

Another very interesting observation is to do with the situation of Biomed in the years 2012 and 2013 when the company realized the beta coefficients lower than 0. It means that price changes of this company's stocks in these years are in opposition to price changes of market index. Such a situation occurs rather rarely and might be very attractive as far as portfolio diversification is concerned.

However cases such as this one, when the beta coefficient is higher than 1 or lower than 0 are rather accidental and occur in case of each company no more than once a year.

## 7. CONCLUSIONS

The results of the study suggest that Polish healthcare industry companies might be portrayed as defensive. Publicly quoted companies from healthcare sector in Poland are characterised in most cases by beta coefficients lower than 1 and higher than 0. Other cases are rather exceptional and may be explained by the theory of economy. Changes in prices of healthcare companies in Poland are lower and less dynamic than price changes for the rest of the market.

However, it is worth bearing in mind some limitations of this study. Due to the fact that it was an initial study dedicated to the classification of Polish healthcare companies as defensive, only the most popular, simple method of beta coefficient estimation was applied. So, it is necessary to keep in mind all the problems mentioned in the article, connected with the proper process of  $\beta$  estimation. Another important issue is the fact that the healthcare companies have been quoted publicly for a relatively short time (Table 1) and the analyzed time series is limited to the period of 2012–2014. This might be too short to incorporate all the aspects as far as market trends are concerned. Actually, the analyzed period covers the time of the moderate bullish market and the consolidation market. Moreover, because of this fact it might be difficult to conduct sound analysis concerning the beta coefficient stability. On the other hand, the analysis was conducted on daily data which means that the attention should be focused on short-term trends rather than on long or mid-term ones. So, it seems that a large amount of daily data allows for reliable analysis. Moreover,

as it is presented in the article (Figure 1) even in this short period of 2012–2014 different types of market fluctuation can be observed.

Taking all into account it can be said that the healthcare sector of publicly quoted companies in Poland is still relatively young and developing. Therefore, the analysis of such a branch has some limitations. All in all, the obtained results suggest that this sector can be portrayed as a defensive industry. However, before implementing presented results into any investment strategy further studies and analysis need to be undertaken, including more advanced statistical and econometric methods.

### REFERENCES

- Babcock G.C. (1972), *A note on justifying beta as a measure of risk*, "Journal of Finance", vol. 27 Issue 3, p. 699–702.
- Banz R.W. (1981), *The relationship between return and market value of common stocks*, "Journal of Financial Economics", vol. 9, Issue 1, p. 3–18.
- Blume M.E. (1971), *On the assessment of risk*, "Journal of Finance", vol. 36, Issue 1, p. 1–10.
- Blume M.E. (1975), *Betas and their regression tendencies*, "Journal of Finance", vol. 30, Issue 3, p. 785–795.
- Blume M.E. (1979), *Betas and their regression tendencies: some further evidence*, "Journal of Finance", vol. 34, Issue 1, p. 265–267.
- Brzeszczyński J. (2005), *Czy klasyczne metody estymacji błędnie szacują parametr beta?*, „Rynek Terminowy”, nr 4, s. 49–53.
- Byrka-Kita K., Kisielewska M. (2002), *Zastosowanie wybranych metod korygowania historycznych wartości współczynników beta na Gieldzie Papierów Wartościowych*, [w:] W. Tarczyński (red.) *Rynek kapitałowy: skuteczne inwestowanie*, cz. 2, Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin, s. 81–89.
- Bossa.pl, internet service dedicated to investments run by BOŚ Bank broker's office, <http://bossa.pl/> [Access 10.07.2015].
- Chan L.K.C., Lakonishok J. (1992), *Robust Measurement of Beta Risk*, "Journal of Financial & Quantitative Analysis", Cambridge University Press, Cambridge, Vol. 27, Issue 2, p. 265–282.
- Chetty S., Rossouw C. (2015), *A consistent earner with defensive qualities*, "Finweek, Media 24", 6/11/2015, p. 49.
- Chudzyńska-Stępień N. (2012), *Akcje w defensywie*, „Forbes”, Wydawnictwo Axel Springer, <http://www.forbes.pl/> [Access 10.07.2015].
- Coetzee L. (2014), *An attractive investment with defensive qualities*, "Finweek, Media 24", 11/6/2014, p. 46–47.
- Czyżycki R. (2012), *Spółki teleinformatyczne jako spółki defensywne na giełdzie papierów wartościowych*, „Zeszyty Naukowe Uniwersytetu Szczecińskiego. Ekonomiczne Problemy Usług nr 101”, nr 746, s. 81–89.
- Feder-Sempach E. (2011), *Ryzyko inwestycyjne: analiza polskiego rynku akcji*, CeDeWu Wydawnictwa Fachowe.
- Gajdka J., Brzeszczyński J. (2007), *Estymacja parametru  $\beta$  przy użyciu modeli klasy ARCH*, „Zeszyty Naukowe Uniwersytetu Szczecińskiego. Finanse. Rynek finansowe. Ubezpieczenia”, nr 6, Cz. 1 *Rynek kapitałowy: skuteczne inwestowanie*, s. 73–81.
- Gęsiński P. (2009), *Czy inwestycja w akcje „defensywne” chroni przed bessą?*, „Rzeczpospolita – Ekonomia”, <http://ekonomia.rp.pl/> [Access 27.06.2015].

- Jajuga K., Jajuga T. (2007), *Inwestycje: instrumenty finansowe, aktywa niefinansowe, ryzyko finansowe, inżynieria finansowa*, Wydawnictwo Naukowe PWN, Warszawa.
- Klemkosky R.C., Martin J.D. (1975), *The adjustment of beta forecasts*, "Journal of Finance", vol. 30, Issue 4, p. 1123–1128.
- Lally M. (1998), *An examination of Blume and Vasicek betas*, "Financial Review" vol. 33, Issue 3, p. 183.
- Letkowski D. (2013), *Badanie stabilności współczynnika beta akcji indeksu WIG20*, „Studia Ekonomiczne”, nr 174, s. 75–87.
- Lewis N. (2004), *Offensive and defensive stock picking*, "Black Enterprise", vol. 35, Issue 1, p. 38.
- Lon E. (2006), *Spółki cykliczne i defensywne na polskim rynku akcji z punktu widzenia inwestora giełdowego*, „Studia i Prace Kolegium Zarządzania i Finansów”, z. 65, 27–42.
- Mahan A.T. (1965), *What price "defensive" stocks?*, "Financial Analyst Journal", vol. 21, no. 5, 69–78.
- Majewski S. (2008), *Empiryczne rozważania o wpływie dywidendy na wartość akcji na Giełdzie Papierów Wartościowych w Warszawie*, „Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania nr 10”, s. 18–31.
- Mazurkiewicz A. (2002), *Analiza stabilności i wrażliwości oszacowań współczynników beta przy wykorzystaniu metody opartej o przedziały kwantylowe*, [w:] W. Tarczyński (red.) *Rynek kapitałowy: skuteczne inwestowanie*, cz. 2, s. 393–401.
- Money.pl, *Polish financial internet service*, <http://www.money.pl/> [Access 01.07.2015].
- Novak J., Petr D. (2010), *CAPM Beta, Size, Book-to-Market and Momentum in Realized Stock Returns*, "Czech Journal of Economics and Finance", vol. 60, Issue 5, p. 447.
- Osińska M., Stempińska J. (2003), *Zmienność parametru beta w modelu Sharpe'a horyzont czasowy inwestycji*, „Nasz Rynek Kapitałowy”, nr 9, 129–136.
- Perron P., Chun S., Vodounou C. (2013), *Sampling interval and estimated betas: Implications for the presence of transitory components in stock prices*, "Journal of Empirical Finance, Elsevier Science", Vol. 20, p. 42–46.
- Pietrzykowski R. (2008), *Ocena ryzyka inwestycji portfela papierów wartościowych*, „Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzanie nr 10”, s.116–124.
- Pogue G.A., Solnik B.H. (1974), *The market model applied to European common stocks: some empirical results*, "Journal of Financial & Quantitative Analysis", vol. 9, Issue 6, p. 917–944.
- Radović M., Vasiljević A. (2012), *The stability of the beta coefficient for the most liquid stocks in the capital market in Serbia in the period 2006–2011*, "Economic Themes", vol. 50, Issue 3, p. 423–441.
- Reinganum M.R. (1982), *A Direct Test of Roll's Conjecture on the Firm Size Effect*, "Journal of Finance", vol. 37, Issue 1, p.27–35.
- Roll R. (1981), *A Possible Explanation of the Small Firm Effect*, "Journal of Finance", vol. 36, Issue 4, p. 879–888.
- Sarker M.R. (2013), *Forecast ability of the Blume's and Vasicek's Technique: Evidence from Bangladesh*, "IOSR Journal of Business and Management", vol. 9, Issue 6, p. 22–27.
- SFG Consulting (2013), *Beta estimation: Considerations for the Economic Regulation Authority*, SFG Consulting, South Bank, Queensland.
- Tarczyński, W. (2009), *Współczynnik beta na polskim rynku kapitałowym*, [w:] P. Chrzan, E. Dziwok (red.), *Metody matematyczne, ekonometryczne i komputerowe w finansach i ubezpieczeniach*, Wydawnictwo Akademii Ekonomicznej im. Karola Adamieckiego, s. 205–218.
- Tarczyński W., Witkowska D., Kompa K. (2013), *Współczynnik beta. Teoria i praktyka*, Pielaszek Research.
- Theodossiou A.K., Theodossiou P. (2014), *Stock return outliers and beta estimation: The case of U.S. pharmaceutical companies*, "Journal of International Financial Markets", vol. 30, p. 153–171.
- Vasicek O. (1973), *A note on using cross-sectional information in Bayesian estimation of security betas*, "Journal of Finance", vol. 28, Issue 5, p. 1233–1239.

- Wang P. (2010), *The ultimate defensive portfolio*, "Money", vol. 39, Issue 4, p. 104.
- Whitfield P. (2015), *Are defensive stocks really that safe*, "Investors Business Daily" 1/21/2015.
- Wierciszewski M. (2011), *Spółki defensywne pomagają WIG20*, „Puls Biznesu” – Internet service, <http://www.pb.pl/> [Access 01.07.2015].
- Zatryb G. (2012), *Koniec sezonu ogórkowego, czas na spółki defensywne*, „Parkiet. Newspaper of Polish Stock Market”, <http://www.parkiet.com> [Access 30.06.2015].
- Zbiejczak M. (2013), *Analiza techniczna liderów defensywnych sektorów z GPW*, Internet investment service „Stockwatch”, <http://wiadomosci.stockwatch.pl> [Access 01.07.2015].

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### CZY POLSKIE SPÓŁKI Z SEKTORA OCHRONY ZDROWIA SĄ DEFENSYWNE?

**Streszczenie.** Głównym celem tego artykułu jest weryfikacja tego, czy firmy działające w polskiej branży ochrony zdrowia mogą być postrzegane jako spółki defensywne. Analizy zawarte w artykule zostały przeprowadzone pośród firm z sektora ochrony zdrowia, notowanych na Gieldzie Papierów Wartościowych w Warszawie. Artykuł oparty został na założeniu, że akcje polskich spółek operujących w branży związanej z ochroną zdrowia mogą być postrzegane jako akcje defensywne. W artykule przedstawiono analizę wskaźników ryzyka porównujących powiązanie pomiędzy zwrotem z inwestycji w akcje określonej spółki i teoretycznej inwestycji w portfel rynkowy. Współczynnik beta ( $\beta$ ) stanowi podstawową miarę przedstawionej analizy. Analiza opiera się na danych z dziennych z okresu 2012–2014.

Wyniki przeprowadzonej analizy sugerują, że akcje polskich firm z sektora ochrony zdrowia notowanych na rynku publicznym mogą być postrzegane jako akcje defensywne.

**Słowa kluczowe:** akcje defensywne, akcje agresywne, akcje cykliczne, akcje niecykliczne, spółki ochrona zdrowia

**JEL:** G11