

THE PROBLEMS AND EFFICIENCY OF INVESTMENT IN SHARES OF COMPANIES WITH A LOW PRICE-TO-BOOK VALUE RATIO IN THE CONTEXT OF INTELLECTUAL CAPITAL ISSUE

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Purpose: The main aim of the article was to present the problems with application of the investment strategy based on companies with low P/BV ratio and to examine its efficiency taking also into account the enterprises' intellectual capital issue.

Design/methodology/approach: The study was conducted with respect to companies listed on the main market of the Warsaw Stock Exchange in the period 2009-2023 and was based on data published by WSE, which for individual companies included in particular P/BV ratio, P/E ratio, share price and EPS. The study was conducted in four approaches: (I) value companies identified only on the basis of P/BV ratio, (II) value companies with an additional result criterion, (III) value companies with an additional price criterion and (IV) value companies with an additional result and price criteria.

Findings: The study carried out in the field of analyzing the efficiency of investment strategies based on companies with low P/BV ratio values, including taking into account the issue of intellectual capital in the enterprise, allows to conclude that, at least from the point of view of the considered period of the study, this is an approach that allows "to overcome" market. At the same time, however, the results of the study showed that the use of easily accessible and popular additional criteria identifying companies in the portfolio does not necessarily provide an advantage over the broad market or the usual approach without additional criteria. This applies especially to a shorter time horizon.

Research limitations/implications: A certain limitation of the study and its results and final conclusions is the adopted, not very long, time frame (11 years), which was partly due to the availability of data and adaptation to the stock market cycle.

Practical implications: Investment strategies based on companies with low price-to-book value ratios are not on the losing end when compared to the market index.

Originality/value: The article presents an original approach to the application of the relationship between the market and book value of enterprises in terms of identifying value entities which have problems in the intellectual capital area. The article is addressed in particular to researchers dealing with the subject of valuation and measurement of intellectual capital in an enterprise, as well as analysts and stock market investors.

Keywords: P/BV ratio, intellectual capital, value stocks, investment strategy.

Category of the paper: Research paper.

1. Introduction

Investment strategies used by investors on the capital market can be very different (Jagielnicki, 2011; Damodaran, 2012; Zaremba, 2013; Jóźwicki, 2024). Some of the more popular and compared with each other in terms of results are the strategy of investing in shares of growth companies and the strategy of investing in shares of value companies (Miller and Prondzinski, 2020). The first is most often associated with high values of price multiples, such as price to book value (P/BV) or price to earnings (P/E), and the second with their low values (Zarzecki, Wołoszyn, 2016; Penman, Reggiani, 2018; Miller, Prondzinski, 2020).

According to Chan and Lakonishok (2004), the discussion of growth and value stocks is one of the best examples of a successful exchange of ideas between academic research and investment practice. On the one hand, the results of academic research have formed the basis for investment strategies that have been implemented in the capital market. On the other hand, the investment community has developed procedures for identifying growth and value stocks and created benchmark indices for them, which has led to continued and deepened scientific research in this area.

The beginnings of dividing companies into the two groups indicated above, as well as the growing interest in the efficiency of investment strategies concerning them, are associated especially with the works of Fama and French (1992) as well as Lakonishok, Shieifer, and Vishny (1994), who drew attention to the so-called "value premium", i.e. higher rates of return on shares of value companies than on shares of growth companies. This premium is explained, on the one hand, by the higher risk of companies with low market multiples, associated with their financial problems and poor results (Fama, French, 1992), and on the other hand, by the underestimation by the market of shares of companies in a difficult financial and earnings situation (companies with value potential) and by the overestimation by the market of shares of growth companies characterized by improving financial and earnings situation (Billings, Morton, 2001; Skinner, Sloan, 2002; Haugen, 1995; Lakonishok et al., 1994; Penman, Reggiani, 2018; Dai, 2023).

The existence of the "value premium", especially in the long term, is confirmed by numerous studies from various stock markets (Fama, French, 1992; Bauman et al., 1999; Sun, 2012; Gupta, Arora, 2019). This situation also undermines the efficient market hypothesis formulated by Fama (1970). According to it, stock prices reflect all information available at a given time, which means that investors cannot expect above-average profits (Malkiel, 2003).

It should also be noted that the advantage of value companies over growth companies in terms of the rate of return on investment is not sustainable over time. As long-term statistics for the US market show, periods of advantage of one group over the other are intertwined, with value companies more often on top and the average rate of return on investment in their case being higher (Giannotto, 2023; Hartford Funds, 2023; Dimensional, 2022).

At this point, it is also worth paying attention to the issues related to the intellectual capital of companies, which overlap with the above considerations, and in a simplified sense is identified with the difference between market value and book value, which is a direct reference to the price to book value ratio (Edvinsson, Malone, 1997; Sveiby, 2010). In this context, especially taking into account historically documented high rates of return, the issue of investing in shares of companies with values of this ratio below 1 is interestingly outlined, where, reasoning in accordance with the approach of Edvinsson and Malone, one can speak of a lack of intellectual capital, or even its negative value.

For this reason, the main aim of the article was to present the problems with application of the investment strategy based on companies with low P/BV ratio and to examine its efficiency taking also into account the enterprises' intellectual capital issue. The study was conducted with respect to companies listed on the Warsaw Stock Exchange based on their share quotations in the period 2009-2023.

The article consists of a theoretical introduction and its expansion in relation to the perception of the P/BV ratio, methodological part, research results and summary.

2. Price-to-book value ratio as a measure of the investment attractiveness of a company and its intellectual capital

2.1. Price-to-book value ratio in general

The market-to-book value ratio (MV/BV), or price-to-book value ratio (P/BV), is one of the most popular price multipliers used on the capital market as part of the financial analysis of companies (market indicators), their valuation (comparative methods), or the assessment of the investment attractiveness of their shares (Nawrocki, 2011):

$$\frac{MV}{BV} = \frac{\text{Market Value}}{\text{Book Value}} = \frac{P}{BV} = \frac{\text{Share Price}}{\text{Book Value per Share}} = \frac{\text{Share Price}}{\frac{\text{Shareholders' Equity}}{\text{Number of Common Shares Outstanding}}} \quad (1)$$

The market-to-book value multiple relates a company's market capitalization to the book value of its equity. This multiple is determined in particular by the expected dividend payout rate, expected growth rate, and risk. The most important factor influencing the multiple is the return on equity – higher rates of return result in higher P/BV multiples. The book value of equity is the difference between the book value of assets and the book value of total liabilities, which makes it very sensitive to the accounting principles applied. Since the book value of an asset reflects its original cost, it may differ significantly from its market value if the asset's value in use has significantly decreased or increased since the acquisition of control (Reilly, Brown, 2001; Janiszewski, 2011).

Depending on whether the equity in the company, which is the basis of the denominator of the P/BV ratio, is positive or negative, the P/BV ratio values can also take positive or negative values, whereby often in the case of negative equity in the company, the ratio is simply not counted and is marked with "x" or "-". The limit value of the ratio can be assumed to be 1, which means that the capital market values the company's shares at the same level as their book valuation (equity per share). Values of the ratio higher than 1 mean that the market valuation is higher than the book valuation, and values below 1 mean that the market valuation is lower than the book valuation (Czekaj and Dresler, 2005). At the same time, however, high values of the P/BV ratio (significantly above 1) do not necessarily mean that the shares of a given company are overvalued, and low values (significantly below 1) do not necessarily mean that they are undervalued.

The perception of overvaluation or undervaluation of a given company's shares by investors, apart from the P/BV ratio itself, is also determined by its financial condition and earning capacity, including in particular expectations regarding improvement in financial results (Sierpińska, Jachna, 2000; Borowski, 2014). A company's shares are overvalued when a high P/BV ratio corresponds to its poor financial condition and lower expectations for results. Companies in which high P/BV ratio values correspond to good financial condition and systematic improvement in financial results are usually positively assessed by the capital market, highly valued and referred to as growth companies. Such companies, apart from high price multipliers such as P/BV or P/E, are particularly distinguished by an upward trend in the results in the past, which according to forecasts is to be maintained in the future, high profitability of sales and return on equity (ROE) and no dividend payments (earned profits are invested in further development) (Segal, 2021). In turn, the undervaluation of a given company's shares can be said to occur when a low P/BV ratio corresponds to an improvement in its financial condition and an increase in result expectations. Companies in the case of which low P/BV ratio values correspond to poor financial condition and deterioration in financial results are usually negatively assessed by the capital market and valued low. Such companies are commonly called "value" due to a certain value potential that can be released if the problem blocking their development is removed (Mikołajewicz, 2014).

2.2. Low price-to-book value ratio as a determinant of low intellectual capital in companies

The interest in the P/BV ratio is not limited to the investment sphere, but has also appeared for many years in the discussion on the measurement of intellectual capital of enterprises in the management literature. The key issue in this context is the perception of intellectual capital (IC) in an enterprise as the difference between its market value (MV) and book value (BV) (Edvinsson and Malone, 1997; Sveiby, 2010):

$$IC = MV - BV \quad (2)$$

This approach to intellectual capital, due to the same variables, can be easily translated into the P/BV ratio (1).

Although the concept of intellectual capital has appeared in management literature for many years (Pirogova et al., 2020), it remains a category that is difficult to define unambiguously (Buenechea-Elberdin, 2017). Both in the literature and in business practice, there are different approaches to defining this category, and in research on the nature of intellectual capital, a certain terminological heterogeneity can be seen. Most often, this capital is identified with intangible assets, hidden assets, invisible assets, intangible assets, non-financial assets, intellectual resources, intangible resources, knowledge capital or intellectual matter (Bombiak, 2016; Śledzik, 2011). Generally speaking, it can be stated that in the definitions of intellectual capital it is perceived in two ways, i.e. as (Sydler et al., 2014; Bombiak, 2016; Hussinki et al., 2017):

- a factor that creates the value of an enterprise and strengthens its competitive advantage, or
- a sum of components, including in particular such as:
 - human capital – the intellectual potential of employees and the possibilities of using it determined by their motivation;
 - structural capital (internal, organizational) – organizational culture, systems, methods and processes, as well as organizational and information infrastructure facilitating the flow of knowledge within the organization and the use of human potential;
 - relational capital (external, network architecture) – all relationships with external stakeholders (investors, suppliers, customers), as well as the reputation resulting from these relationships.

The specificity of intellectual capital is well reflected in the “iceberg” model and the “tree” metaphor, which emphasize the importance of intangible values or resources, which are most often invisible to the environment, but at the same time have a greater ability to generate added value for the company than standard material resources visible in the balance sheet (Dobiegała-Korona, Herman, 2006; Adamska, 2015).

In relation to the above-mentioned concepts of intellectual capital, an interesting approach to its measurement, based on the difference between market value and book value (MV – BV) and particularly suitable for explaining the situation where $MV < BV$, was proposed by Sveiby (1989) in the form of the so-called "*the invisible balance sheet*". In this approach, the balance sheet containing intangible assets consists of two levels – the first is the visible part, which corresponds to tangible assets and book value, and the second is the invisible part, which describes intangible assets and their hidden sources of financing (Dziewulski and Skowron, 2020). In connection with the above, a higher value of BV over MV can be associated not so much with the total lack of intellectual capital, or its negative value, but with the company's problems in terms of certain assets in the invisible part, which obscure the positive effects of

other assets, giving generally weaker results "visible" in financial statements and negative perception by investors, which in turn leads to a devaluation of shares on the capital market.

Returning to the issue of using the P/BV ratio as a determinant of the level of intellectual capital in enterprises, it should be noted that this is a simple but at the same time very imperfect approach. Its criticism emphasizes its far-reaching generality (Kasiewicz et al., 2006) and combining the monetary value of intellectual capital with the value also generated by other types of capital in the enterprise (Jardon, Martinez-Cobas, 2021). In addition, attention is drawn to the significant burden of this approach, often occurring in the case of listed companies, with the significant dynamics of changes in their market quotations (prices), which may lead to distortions in the measurement and assessment of the level of intellectual capital of the analyzed entities (Nawrocki, 2022). In this respect, it is worth bearing in mind that the price of shares of companies on the stock market is influenced not only by objective factors, but to a large extent its changes are the result of investors' emotions and their reactions to various information and related expectations (Zaremba-Śmietański, 2013). This is especially true for the issue of the impact of external factors that are beyond the control of management staff and are characterized by randomness (Jarugowa, Fijałkowska, 2002; Palimąka, Mierzejewski, 2016). It should also be noted that regardless of distortions concerning market value, a similar problem may also occur with respect to book value, which is dependent on accounting principles (Bakuh et al., 2001). The criticism of measuring intellectual capital based on the difference between MV and BV also draws attention to the differences in the nature of these values. Book value is calculated based on historical balance sheet data, while market value is the result of predicting the situation of the company in the perspective of subsequent years (Palimąka, Gumieniak, 2014).

On the other hand, despite the wide criticism of the use of the P/BV ratio in measuring intellectual capital, its use is supported by its universality, which allows for external measurement of intellectual capital, the data necessary for measurement are publicly available, and the obtained results can be compared between companies, and it is also possible to present changes in the indicator over time (Bayer, 2014). Hence, this method is more suitable for the initial identification of entities with a potentially low level of intellectual capital, or even its absence, than for precise measurement in this regard. At the same time, its credibility can be increased by relying on the quotations, or P/BV ratio, of the analyzed companies in the form of an average or median over a longer period (preferably several years). Due to this, individual low readings, often the result of a temporary increase in emotions among investors, will only have a limited impact on the picture of the situation of the analyzed entities. Moreover, indications of a low level, or lack, of intellectual capital of the entities analyzed based on the P/BV ratio should be subject to verification based on an assessment of changes in their economic and financial situation (Nawrocki, 2022).

3. Research methodology

The main aim of the article was to present the problems with application of the investment strategy based on companies with low P/BV ratios and to examine its efficiency taking also into account the enterprises' intellectual capital issue. The study was conducted with respect to companies listed on the main market of the Warsaw Stock Exchange in the period 2009-2023, which was dictated by the availability of data, while verifying the following research hypotheses:

- H1: Investing in companies with a low P/BV ratio allows you to beat the market, i.e. achieve a higher rate of return than the rate of return on the WIG index.
- H2: Investing in value companies identified using an additional income criterion allows you to beat the market, i.e. achieve a higher rate of return than the rate of return on the WIG index.
- H3: Investing in value companies identified using an additional price criterion allows you to beat the market, i.e. achieve a higher rate of return than the rate of return on the WIG index.
- H4: Investing in value companies identified using both additional criteria, i.e. income and price, allows you to beat the market, i.e. achieve a higher rate of return than the rate of return on the WIG index.
- H5: The use of an additional, resulting criterion identifying value companies increases the effectiveness of the investment compared to relying solely on the P/BV ratio.
- H6: The use of an additional, price-based criterion identifying value companies increases the effectiveness of the investment compared to relying solely on the P/BV ratio.
- H7: The efficiency of investing in value companies identified using additional criteria, i.e. income and price, is higher than the efficiency of investing in "ordinary" companies with value potential identified solely on the basis of the P/BV ratio.
- H8: The efficiency of investing in companies with a low P/BV ratio increases with the length of the investment period.
- H9: The effectiveness of investing in value companies identified using an additional income criterion increases with the extension of the investment period.
- H10: The effectiveness of investing in value companies identified using an additional price criterion increases with the extension of the investment period.
- H11: The effectiveness of investing in value companies identified using both additional criteria, i.e. income and price, increases with the extension of the investment period.

The study was based on data published by WSE (GPW, 2009-2023), which for individual companies included: number of shares issued, market value, book value, P/BV ratio and P/E ratio. All data is provided as of a given day. In addition, based on the above-mentioned data, the following were also calculated for individual companies: share price (market value / number of shares issued) and EPS (share price/P/E ratio).

Taking into account the main objective of the article, the formulated research hypotheses and the availability of data, the study was conducted in four approaches:

- I. limited to the first decile of companies with the lowest P/BV ratio values on a given day (value companies identified solely on the basis of P/BV ratio);
- II. limited to the first decile of companies with the lowest P/BV ratio values on a given day, while excluding companies without profit in a given year and 3 years back (value companies identified on the basis of P/BV ratio with an additional result criterion);
- III. limited to the first decile of companies with the lowest P/BV ratio values on a given day, while excluding "penny" companies, i.e. those with a market price of one share below 1 PLN (value companies identified on the basis of P/BV ratio with an additional price criterion);
- IV. limited to the first decile of companies with the lowest P/BV ratio values on a given day, while excluding companies without profit in a given year and 3 years back and "penny" companies, i.e. with a market price of one share below 1 PLN (value companies identified on the basis of P/BV ratio with additional criteria, i.e. result and price).

The calculations were to be carried out based on the adopted algorithm (Figure 1).

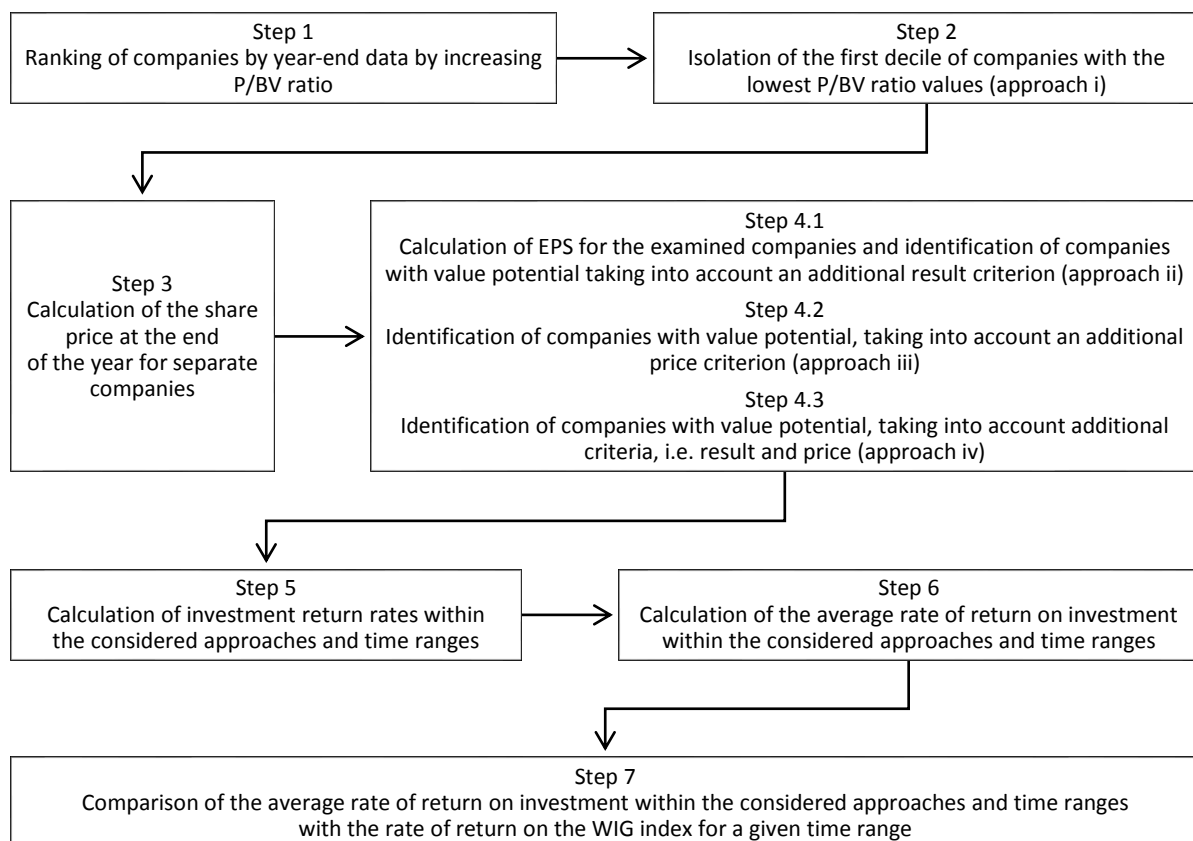


Figure 1. Calculation algorithm.

Source: Own work.

The arrangement of companies listed on the WSE main market according to year-end data by increasing P/BV ratio (step 1) was assumed to start from 2012 and end in 2022. Then (step 2), it was assumed to distinguish for each year the first decile of companies with the lowest P/BV ratio values (simple identification of value companies) and in step 3 to calculate the share prices at the end of the year for the previously distinguished companies in each of the years under consideration. In the broadly understood step 4, it was assumed to calculate an additional data, i.e. EPS, which will allow for the identification of value companies taking into account an additional result criterion, confirming a positive result situation, i.e. generating positive EPS (step 4.1), value companies taking into account an additional price criterion, i.e. share price above 1 PLN (step 4.2) and companies with value potential taking into account both of the additional criteria mentioned, i.e. income and price (step 4.3). In step 5, it was assumed that the investment growth rates were calculated within the considered approaches and time ranges (price from the examined period/price from the base period – 1), and then (step 6), based on them, the average rates of return were calculated (arithmetic mean). Taking into account also annual shifts within the time ranges of investments longer than one year, this gave for each of the considered approaches 11 one-year cases, 10 two-year cases, 9 three-year cases, 8 four-year cases, 7 five-year cases, 6 six-year cases, 5 seven-year cases, 4 eight-year cases, 3 nine-year cases, 2 ten-year cases and 1 eleven-year case. In the last, seventh step, it was assumed that the average rates of return calculated in step 6 within the individual approaches and time ranges would be compared with the rate of return from the WIG index for a given time range, which will allow us to determine whether a given approach allows us to beat the market.

4. Research results

The efficiency analysis of the investment strategy based on companies with low P/BV ratios, taking also into account additional criteria, was carried out in accordance with the methodology outlined in the previous section.

Due to the considerable volume of calculations and obtained results, the following sections limit the presentation only to the final results (rates of return on investment) within the individual approaches and time ranges (Tables 2-5), including, as a point of reference, the results for the WIG index (Table 6).

Table 2.

Individual and average rates of return on investment in value companies identified only on the basis of P/BV ratio – values for individual time ranges

Start year	Investment time frame in years										
	1	2	3	4	5	6	7	8	9	10	11
2012	21%	4%	1%	26%	58%	36%	38%	62%	65%	58%	62%
2013	-23%	-19%	-2%	-12%	-29%	-30%	-12%	3%	1%	2%	
2014	-5%	16%	30%	0%	-2%	37%	113%	117%	142%		
2015	22%	45%	-1%	-1%	39%	104%	107%	149%			
2016	5%	-29%	-25%	13%	37%	40%	76%				
2017	-31%	-39%	15%	63%	79%	89%					
2018	11%	81%	119%	113%	170%						
2019	143%	228%	150%	151%							
2020	52%	36%	100%								
2021	-5%	45%									
2022	48%										
Average	22%	37%	43%	44%	50%	46%	65%	83%	69%	30%	62%

Source: Own calculations based on WSE data.

Table 3.

Individual and average rates of return on investment in value companies identified based on P/BV ratio and the outcome criterion – values for individual time ranges

Start year	Investment time frame in years										
	1	2	3	4	5	6	7	8	9	10	11
2012	18%	2%	-4%	12%	32%	14%	16%	38%	42%	39%	43%
2013	-20%	-15%	-4%	-19%	-37%	-39%	-25%	-8%	1%	2%	
2014	-5%	8%	19%	-12%	-17%	20%	112%	118%	144%		
2015	16%	40%	-6%	-5%	26%	93%	103%	153%			
2016	2%	-28%	-25%	8%	37%	40%	85%				
2017	-29%	-38%	5%	53%	79%	104%					
2018	10%	84%	124%	117%	182%						
2019	108%	232%	159%	153%							
2020	50%	42%	115%								
2021	-8%	32%									
2022	45%										
Average	17%	36%	43%	38%	43%	39%	58%	75%	62%	20%	43%

Source: Own calculations based on WSE data.

Table 4.

Individual and average rates of return on investment in value companies identified with the P/BV ratio and price criterion – values for individual time ranges

Start year	Investment time frame in years										
	1	2	3	4	5	6	7	8	9	10	11
2012	17%	10%	17%	43%	85%	67%	57%	91%	97%	89%	95%
2013	-10%	-20%	-10%	2%	-28%	-23%	-11%	10%	32%	35%	
2014	2%	28%	47%	2%	-4%	47%	166%	184%	223%		
2015	27%	77%	22%	9%	58%	173%	207%	243%			
2016	12%	-31%	-29%	-10%	15%	22%	42%				
2017	-39%	-43%	-19%	24%	23%	81%					
2018	-7%	16%	63%	69%	93%						
2019	99%	159%	124%	105%							
2020	42%	40%	76%								
2021	-6%	43%									
2022	33%										
Average	16%	28%	32%	30%	34%	61%	92%	132%	117%	62%	95%

Source: Own calculations based on WSE data.

Table 5.

Individual and average rates of return on investment in value companies identified with the P/BV ratio and the result and price criteria – values for individual time ranges

Start year	Investment time frame in years										
	1	2	3	4	5	6	7	8	9	10	11
2012	6%	0%	6%	14%	53%	46%	32%	71%	78%	71%	78%
2013	-8%	-19%	-9%	1%	-27%	-24%	-14%	6%	32%	35%	
2014	4%	30%	50%	4%	-2%	46%	173%	190%	228%		
2015	29%	84%	26%	13%	55%	178%	210%	255%			
2016	7%	-30%	-29%	-9%	7%	13%	42%				
2017	-39%	-43%	-15%	21%	17%	94%					
2018	-7%	16%	63%	69%	93%						
2019	103%	166%	129%	109%							
2020	43%	41%	78%								
2021	-8%	29%									
2022	27%										
Average	14%	27%	33%	28%	28%	59%	89%	130%	113%	53%	78%

Source: Own calculations based on WSE data.

Table 6.

Individual and average rates of return on the WIG index

Start year	Investment time frame in years										
	1	2	3	4	5	6	7	8	9	10	11
2012	8%	8%	-8%	9%	34%	22%	23%	20%	46%	21%	65%
2013	0%	-15%	1%	24%	13%	14%	11%	35%	12%	53%	
2014	-15%	1%	24%	12%	14%	11%	35%	12%	53%		
2015	18%	46%	32%	34%	30%	58%	31%	79%			
2016	23%	11%	13%	10%	34%	11%	52%				
2017	-9%	-8%	-11%	9%	-10%	23%					
2018	2%	-1%	20%	0%	36%						
2019	-3%	18%	-2%	34%							
2020	22%	1%	38%								
2021	-17%	13%									
2022	37%										
Average	6%	7%	12%	16%	22%	23%	30%	37%	37%	37%	65%

Source: Own calculations based on WSE data.

In order to better illustrate the differences in the scope of the obtained research results, Figure 2 presents the average rates of return within the considered approaches and time ranges, taking into account the results for the WIG index as a reference point.

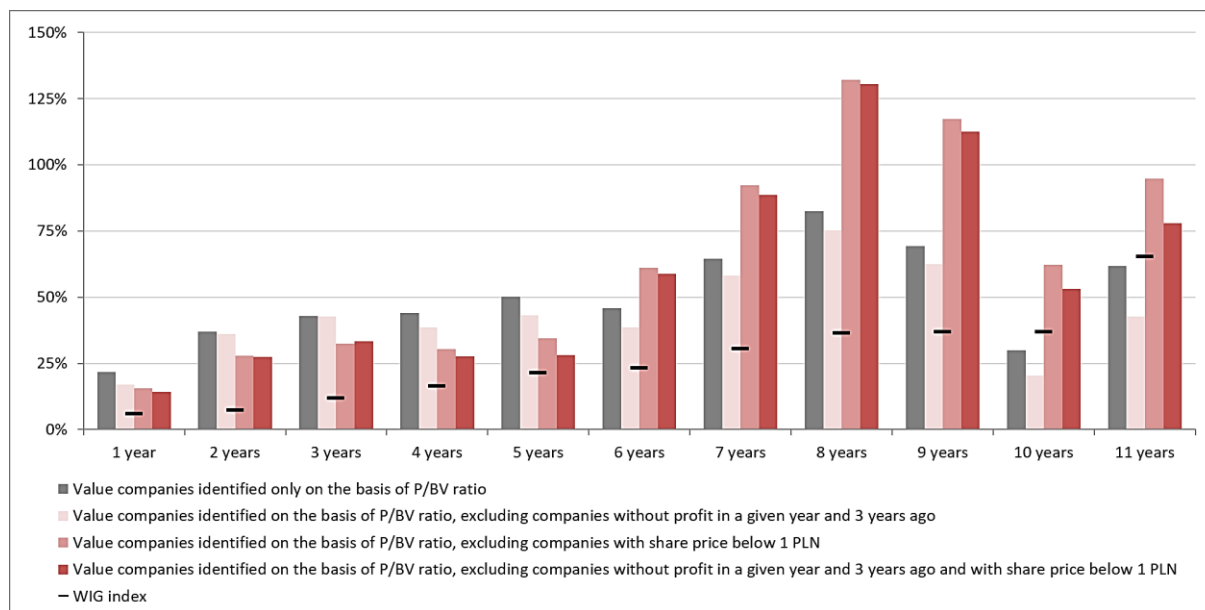


Figure 2. Average rates of return on investment for specific approaches and time ranges.

Source: Own calculations based on WSE data.

Taking into account the obtained results, it should be stated first of all that investments in companies with a low P/BV ratio from the perspective of average rates of return allowed to beat the market (WIG index) in almost all considered approaches and time ranges. Only in the long investment horizon (10 and 11 years) the average rate of return from the WIG index was higher than the average rate of return from value companies, but only those identified only on the basis of the P/BV ratio or with the additional exclusion of entities without profit in a given year and 3 years back. Therefore, from the point of view of average rates of return, hypotheses H1 and H2 can be considered partially true (for an investment horizon of up to 9 years inclusive), and H3 and H4 as fully true.

Secondly, the use of additional criteria (income and/or price) to identify value companies for investment has a positive impact on the average rate of return only in the longer term (from 6 years upwards) and mainly concerns the price criterion or the use of both additional criteria, i.e. income and price. Hence, assuming the perspective of average rates of return, it can be stated that hypothesis H5 is false, and hypotheses H6 and H7 are conditionally true, i.e. assuming an investment horizon of over 5 years.

Third, taking the perspective of average rates of return, the obtained results indicate that, in general, the efficiency of investments within the four approaches considered increases with the extension of the investment time range (hypotheses H8-H11), although at the same time this relationship is not perfect. In all approaches, there is a certain slight “retraction” of the rate of return for the investment period of 4 years and a much more pronounced one for investments lasting 9 and 10 years. Therefore, from the perspective of average rates of return on investment, hypotheses H8-H11 are only partially true, in particular with respect to shorter investment time ranges (up to 4 years).

At the same time, it should be noted that in detail, i.e. taking into account individual portfolios created in individual years for different time ranges, the obtained results do not allow for full confirmation of any of the formulated research hypotheses.

5. Summary

The conducted study on the analysis of the effectiveness of investment strategies based on companies with low P/BV ratio values allows us to state that, at least from the point of view of the period of the study under consideration, this is an approach that allows us to "beat" the market. At the same time, however, increasing the effectiveness of this investment approach and consolidating it over time requires the implementation of "more sophisticated" additional criteria in order to eliminate random and potentially problematic companies. As the results of the study have shown, the use of easily accessible and popular additional criteria identifying companies for the portfolio (EPS and price) does not necessarily provide an advantage over the broad market or the usual approach without additional criteria. This applies especially to a shorter time horizon. At the same time, however, it must be borne in mind that reaching for other, as they were called "more sophisticated", additional criteria is associated, due to their limited direct availability, with a much greater time and effort required to apply a given investment strategy.

It is also worth noting that even if the research hypotheses considered indicated the advantage of one approach over the other (strategies without additional criteria vs. strategies with additional criteria), this advantage was not complete, i.e. it did not apply to all the cases considered. In this respect, it should be borne in mind that changes in the prices of shares of companies on the capital market do not always result from their fundamental or technical situation. Moreover, on the capital market, similarly to the economy, we are dealing with the phenomenon of cyclicality, which means that even fundamentally weaker entities have better periods of quotations and their share prices increase. Hence, expecting a permanent victory over the market for a longer period of time is unlikely. These issues are discussed more broadly by the theory of market efficiency or the theory of random walk (Fama, 1970; Malkiel, 2014). Nevertheless, taking into account the results of the efficiency of the analyzed strategy, it can be stated that although it does not guarantee beating the market every time, it increases the probability of beating it in the longer term, provided that the established assumptions are adhered to.

Undoubtedly, a certain limitation of the conducted study and its results and final conclusions is the adopted, not very long, time frame (11 years), which resulted partly from the availability of data and adjustment to the stock market cycle.

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