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THE PROFITABILITY OF THE STRATEGY LINKING FUNDAMENTAL, PORTFOLIO AND TECHNICAL ANALYSIS ON THE POLISH CAPITAL MARKET

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Abstract

In the article, several methods of taking investment decisions are described: a fundamental, portfolio, and technical analysis. They constitute different approaches which are convenient for different types of investors with various expectations and time horizons of their investments. The simultaneous combination of these three analyses is not popular. The aim of this study is to test the effectiveness of simultaneous use of a fundamental analysis, portfolio analysis, and technical analysis for shares quoted on the Warsaw Stock Exchange (WSE) in 2000–2007. The research hypothesis is advanced that the concurrent-linked application of a fundamental, portfolio, and technical analysis brings better results than the separate use of these analyses. Models of capital market, such as CAPM and APT, have been used, as well as P/E ratio, Return on Equity (RoE), Relative Strength Index (RSI), and Exponential Moving Average (EMA). The combination of a financial analysis, technical indicators, and models of the capital market in order to invest on the stock exchange is author's own method. In general, the survey has been carried out on the grounds of quantitative methods (financial analysis, regression model, and multi regression model) and a comparative analysis. The results of the research have been used to create diversified portfolios on the WSE. It occurs that the concurrent use of the three analyses brings the highest rate of return of a portfolio.

Keywords: fundamental analysis, portfolio analysis, technical analysis, the Warsaw Stock Exchange, CAPM

JEL classification: C00, C01, G11, G12, G23

Introduction

There are several methods helpful in making investment decisions, among which the most important are a fundamental, portfolio, and technical analysis. Widely described in literature is the use of the fundamental as well as technical analysis, which have been used for many decades. Linking these two analyses constitutes a common approach. The simultaneous combination of the portfolio analysis and the fundamental or technical analysis is not as popular as the concurrent application of the fundamental and technical analysis. Literature is focussed mainly on the separate aspects of each analysis. This precisely makes up a motive for carrying out research which would demonstrate that in certain market conditions such a link-up between the three methods can bring positive results – a higher rate of return than the return of the benchmark (market portfolio). The research conducted in this article covers the application of the fundamental, portfolio, and technical analysis in the process of portfolio creation. The combination of the financial analysis, technical indicators, and models of the capital market in order to invest on the stock exchange is the author's own method.

The aim of this study is to test the effectiveness of the simultaneous use of the fundamental, portfolio, and technical analysis for stocks quoted on the Warsaw Stock Exchange (WSE) in 2000–2007.

The research hypothesis is as follows: the concurrent linked application of the fundamental, portfolio, and technical analysis brings better results than the separate use of these analyses.

Several tools have been offered by the three analyses so that to create the portfolio of firms which might be characterized by as high as possible rate of return in comparison with benchmark (market portfolio).

The scope of work involves substantial, spatial, and time aspects. First and foremost, the fundamental, portfolio, and technical analyses have been applied in order to create diversified portfolios of the companies quoted on the WSE. Time period from 2000–2007 has been chosen to analyse the results in different market conditions – both in bearish and bullish market, just before the world financial crisis in 2008–2009. The research conducted is based on the author's own method consisting of a sequence of a few stages. In general, the survey has been carried out on the grounds of quantitative methods and a comparative analysis.

The article consists of three parts – the first one is theoretical and the next two are empirical. Subsection 1 has been focussed on the problems of the fundamental, portfolio, and technical analysis in literature, and its simultaneous application. Subsection 2 begins with the description of the research method, as well as with all the assumptions in a substantial, time, and spatial

dimension. Then, the consecutive stages of the research have been discussed. Diagrams attached are very helpful in understanding and steady tracking these subsequent phases.

In subsection 3, companies from each sector have been selected for each diversified portfolio. Moreover, the comparison between the rates of return of diversified portfolios has been presented. Then, conclusions have been drawn and the hypothesis has been verified.

The literature cited covers such issues as corporate finance, finance management, macroeconomics, econometrics, statistics, and a stock market analysis.

In order to obtain a great deal of information for empirical study, the source data provided by the Ministry of Finance, Central Statistical Office in Poland, and the WSE have been used. Also, a lot of information from web financial portals, such as bankier.pl, stooq.pl, and money.pl, has been utilized. All source data derive from 2000–2007.

1. Research assumptions and the problem of the simultaneous application of a fundamental, portfolio, and technical analysis in literature

The problem of the simultaneous use of a fundamental and technical analysis is often raised in literature. Nevertheless, very rare is the approach of adding to this also a portfolio analysis. William O'Neill (2000, pp. 19–24) presented the first manner as worth recommending. His experience proves that an investor has to know not only information signifying the strength, quality, and the condition of firms, but also should notice how their stocks behave on the stock market. He treats the fundamental analysis as the objective basis of taking investment decisions. Thanks to it, he can seek for the companies having extraordinary results, especially in terms of a profit – sufficient seem to be 3 consecutive years in which gains rose year by year. When such a company has been found, it is possible to apply the tools of the technical analysis. But only in this order – the technical analysis cannot be utilized before the fundamental analysis. Therefore, a chart of price may point out specific formations, or indicators can generate buy signals. Tarczyński and Łuniewska (2004, pp. 55–59) indicate the fundamental analysis as a tool for investors with a long-term investment horizon.

Also, Burton Malkiel (2003, pp. 113–116) describes linking the fundamental with technical analysis as widely used. He proposes the assessment of P/E indicator and its dynamics within the space of several years, and also, he suggests looking for a credible technical sign heralding the beginning of an upward trend. In general, both analyses serve as a tool to find the best possible moment to buy or sell stocks. Such an approach is often the basis to build investment strategies (About.com, 2015).

Although the application of the fundamental and technical analyses is popularized, they do not include the measurement of correlation between risk and returns. The portfolio analysis offers such a measurement, and that is a real value added which should be taken into consideration. In literature, it is difficult to find the simultaneous application of these 3 analyses. Certainly, each of them has its pros and cons. Many problems occur during the attempts of using them concurrently. Particularly, the problems related to the method of calculation. In the research carried out in this article, the outcomes of Arbitrage Pricing Method and Capital Asset Pricing Model have been calculated on the basis of data from 2000–2006. So, it requires a stream of daily/weekly/quarterly stocks quotations data. On the contrary to this, in the fundamental analysis, for RoE and P/E, financial statements are needed – net profit, equity, and earnings per share which were worked out in the previous year. Additionally, the current market price is necessary to estimate Price/Earnings ratio. In the technical analysis similar problems occur. RSI and EMA have been counted by the formulae that uses the range of data from the past. In the case of this article research, it is 5 weeks for RSI, 5 and 25 weeks for EMA. Nevertheless, everybody must be aware that each of the analyses has its own particular characteristic which decide about their peculiarity. The difference in time frames does not mean they cannot be matched.

Another problem is that for counting indicators of the technical analysis, and estimating the expected rate of return in CAPM and APT, past stock exchange data have been used. For the fundamental analysis, historic data do not play such a significant role. Crucial is the appositeness of prognosis. In the econometrical and statistical literature, the subject of preparing prognoses is broadly discussed.

Especially important for the investors is forecasting future expected stock prices levels, even if this task is extremely sophisticated and burdened with several errors (Gruszczyński, Kuszewski, Podgórska, 2004, pp. 99–101). It can be done, for instance, by trend extrapolation, especially for movements in long-term (Tyran, 2004, p. 338). In this paper, the values which occurred in reality in 2006 have been taken into account. But one must remember that in fact, such data are known when the stock company publishes the final yearly financial statement, that is usually several months after the end of the previous year. Consequently, nobody may rely on the actual data because, simply, it does not exist. Instead, there are many prognoses announced by, for instance, brokerage houses. The assumption taken in this article comes down to the fact that brokers prognoses about the profit and equity were ideally suitable.

To the needs of the research conducted in this paper, the time frame from 2000 to 2007 has been selected. The quotation data derive from 2000 to 2006, and the performance of consecutive portfolios has been verified relying on the data from 2007. It has been assumed that companies

were bought in the first session of 2007, and sold in the last session of 2007. It is important to answer why it is so. First, as it was mentioned earlier, 20 years of WSE existence abound in bullish and bearish periods so the author wanted to check the method of creating portfolios in different market circumstances (prices fell from 2000 to 2003 and rose from 2003 to 2006). Second, the data should be taken from a period of time relatively close to the actual moment of carrying out the research. Third, during the period mentioned, WSE was by far more experienced market in 2007 than in 1990s. Fourth, there was a considerable decline in prices from 2007 to 2011. As a consequence, each portfolio result would show sub-zero rate of return, and this fact would make the research less credible. Fifth, the year 2007 seems to be just ideal to verify performance due to the simultaneous bullish and bearish market existence – one half of the year was bullish and in the second half, the value of WIG was falling down. Moreover, 2007 is the year just before the outbreak of the world financial crisis, when it started to have a huge impact on quotations on stock exchanges. As a consequence, it is a unique year to study the behaviour of stock prices on the pre-crisis data. Owing to the above facts, the selection of years 2000–2007 is legitimate – the research has been pursued in relatively stable conditions.

The survey has been carried out with the use of the data from Polish capital market. The survey can be especially interesting for Polish readers due to the fact that only the companies quoted on the WSE have been taken into consideration. Doing the research has been possible on the grounds of the satisfactory liquidity, which plays a crucial role for institutional investors, above all.

When it comes to the main subject of the research – sectors and companies selection – 6 sectors have been chosen, and in each sector no limitation has been granted in terms of the number of companies designated to every sector. There are 3 general industries in the WSE, i.e. finance, an industrial sector, and services. With the aim of diversifying portfolios as much as it is possible, it has been believed to be desirable to consider all of these industries. Four sectors chosen for the research come from the main industrial sector, i.e. food, metallurgical, construction, the primary and fuel sector (Wawryszuk-Misztal, 2007, p. 105). As a result, food industry, metallurgical sector, construction sector, the primary and fuel sector, banking sector, and other services sectors have been included. The primary sector and fuel sector have been matched in the research due to the importance of KGHM company (copper conglomerate) that has a great influence on WSE quotations (huge capitalisation and volume), and it is the only firm from the primary sector which could have been attached. As far as the choice of the companies is concerned, one main criterion has been established, namely, the company taken to the research

should be quoted on WSE since at least 2004, so that to provide enough data to carry out a credible study (2-year data is an absolute minimum).

2. The method of creation of diversified portfolios

Figure 1 presents the main manner in which calculation is provided (the general profile of the survey), as well as some details about each stage. It is very important to stress that the whole research – the general idea as well as the carefully drawn-up detailed method – has been worked out by the author of this article.

This subsection is concentrated mainly on the method of the research. One of the main goals of the research is to test the influence of the simultaneous application of the fundamental, portfolio, and technical analysis on the portfolio rate of return. To do so, and to obtain objective results, a large number of companies is required. On the whole, 59 companies have been chosen from banking, construction, food, metallurgical, the primary and fuel sector, and other services. They are taken from different sectors to diversify the source data. The data of stocks quotations from 2000 to 2007 have been utilized.

The research consists of 7 main stages which are presented on Figure 1. The survey has been divided into stages in order to make it transparent, and to provide the clear distinction between selection, calculation, creation of portfolios, and conclusions. Moreover, it indicates the extensiveness of the research, and the complex nature of investment issues, which is helpful in verifying the aim of this article. Realizing each stage, one by one, has been necessary to build portfolios of the companies. The stages are as follows:

1. Selection of the sectors which have significant stake in WIG.
2. Selection of the companies designated to each sector.
3. Carrying out a survey of 3 analyses for each selected company from WSE. The survey is based on the source data from 2000–2006.
4. Rankings creation within the industries on the grounds of 3 analyses tools. The results of the individual analyses are taken into consideration. Some of the analyses are linked.
5. Diversified portfolios creation by means of choosing shares from the first places of 6 sector rankings.
6. Detailed statement of the results of the individual portfolios compared with WIG rate of return.
7. Conclusions.

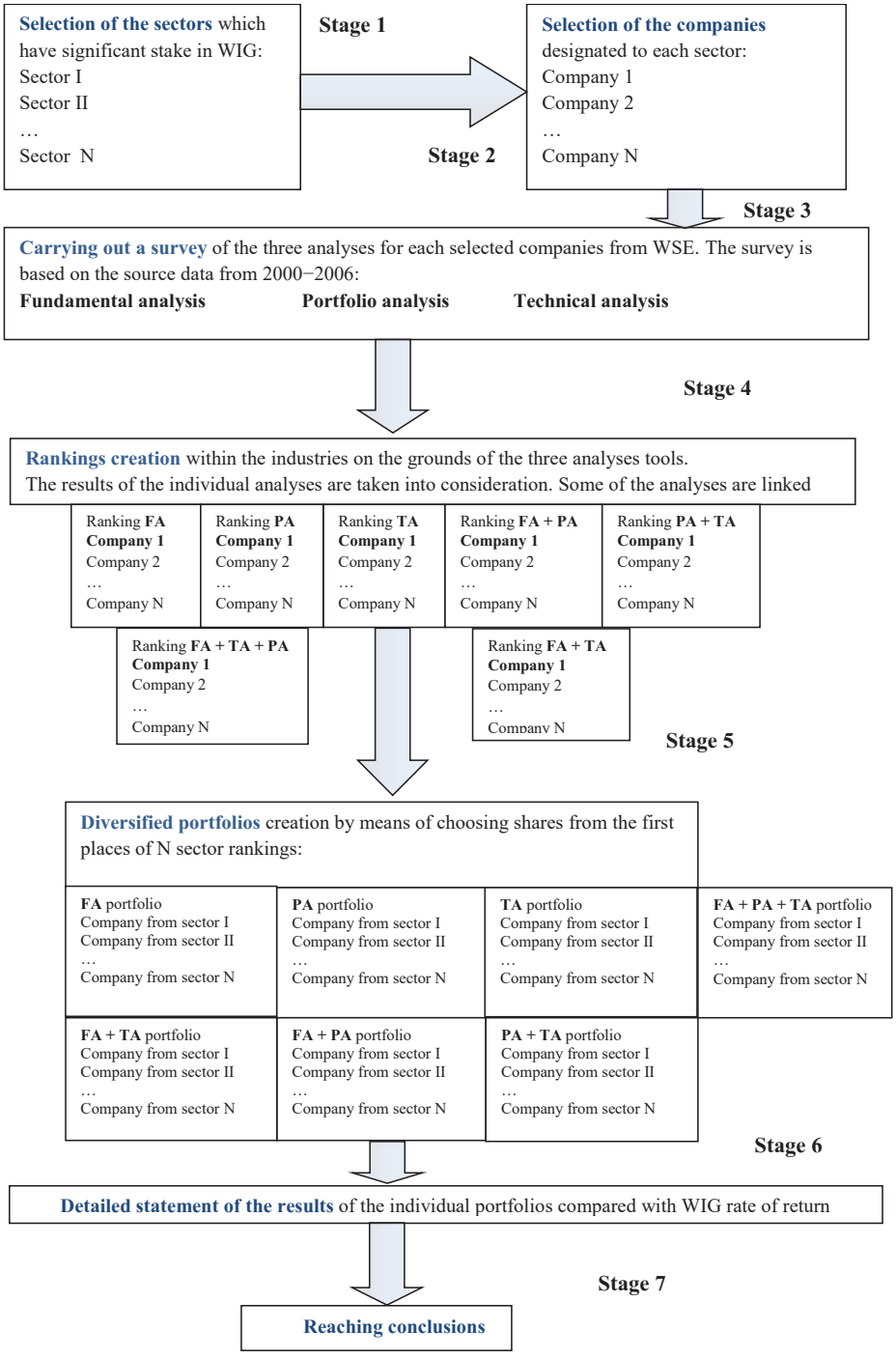

Figure 1. Stages of research

Source: own elaboration.

The selection of sectors is the first stage, and the selection of the companies is the second stage of the research. Generally, 3 main industries can be singled out on the WSE: finance, a service industry, and an industrial sector, which group many smaller sectors (GPW, 2015a). In the first place, sectors have been chosen in terms of their significance for the WSE at the beginning of 2007. This means that such sectors had important participation in the whole market represented by WIG index, the companies operating in that businesses were well known and had a great capitalisation. These sectors provide sufficient diversification because they are usually dependent on different incentives. They represent different business activities, for instance, they have been selected from finance as well as from industry and services. To conclude, diversification has been the most important criterion in the selection of sectors. There are 6 companies in each diversified portfolio. It means that from every sector, 1 company has been selected, and it provides satisfactory diversification. Moreover, 6 sectors have been chosen (out of 26 sectors) from finance, industry, and services to provide proper diversification. Further, the firms only from these sectors have been taken into consideration while conducting the research. As a consequence, the portfolios represent the wide range of the market. The sectors selected include: banks from the finance industry; food, the primary and fuel sector, construction, metallurgical, and other services from the service industry. These sectors have been selected because they are significant. First, a lot of companies operate in these industries. Second, they have a large capitalisation and accountant value. Third, their percentage stake in the value of the whole market is considerable. Fourth, enough diversification has been provided. Fifth, they are not equally dependent on the same negative incentives. The above-mentioned sectors accounted for more than 60% of WSE total capitalisation (state on the 2012) (GPW, 2015a; GPW 2015b). Consequently, the survey seems to be more objective because it represents the majority of the capital on the stock exchange.

The next stage is about designating companies to each chosen sector. There is no limit in the number of firms that can be matched to each sector in order to provide the large number of companies that would potentially be included in diversified portfolios. It ensures the greater diversification. Furthermore, the outcome of the research is more credible and representative when it is based on the wide sample of data. Consequently, many firms have been selected from the construction and banking sector. On the contrary to this, the enterprises from the primary and fuel sector, make up only a tiny part of the whole group. It is important to emphasize that normally in statistics, the primary sector and the fuel sector are separated and they are not grouped together. Nevertheless, in this research, the author linked calculations for these 2 industries due to their significance for the Polish economy. In the primary sector, only KGHM

fulfilled the requirements to be chosen for the research. Other companies were issued on the stock market after 2005. Similar situation was with the fuel sector – only 4 companies were suitable enough to be tested.

Certainly, all of the tested companies had to fulfil special requirements. First, their everyday liquidity of its quoted stocks had to be enough to enable an individual investor to acquire shares. The total turnover on the consecutive firms could not have been less than PLN 10,000 per day. This value has been established arbitrarily by the author of this paper, in order to provide the potential opportunity for households to invest little savings in such stocks. Second, the capitalisation had to be sufficient. Third, their brands had to be well-known and recognizable throughout consumers in Poland.

The total number of companies amounts to 59. At the end of the year 2006, there were 284 shares quoted on WSE, so the survey consisted of 20.77% of the total number of shares. Hence, the research sample is likely to copy the whole group of the companies quoted on the WSE truly and accurately. In general, the selected companies belong to the biggest ones on the Polish market. Their brands are quite well-known. As far as banks are concerned, all of those listed are among the largest financial institutions in Poland. Their capitalisation is big, especially in Polish conditions. Summing up, these enterprises have a reputation of being able to operate in good times and in the crises as well, in a profitable manner.

The third stage has been the most laborious one because calculations have been its core essence. Firstly, it is important to emphasize that the sectors and companies on the inside were tested in a row, but separately. In the end (in the next stages), the results of the whole survey have to be matched to create rankings. At this point, each industry has been taken individually, and its companies have been also examined one by one. Shares have been tested individually in terms of 3 analyses: fundamental, portfolio, and technical. Each analysis has 2 indicators (methods) which have been taken into account.

First, it goes through the fundamental analysis paying special attention to 2 indicators: Price Earnings Ratio (P/E) and Return on Equity (RoE). Price/Earnings ratio is calculated by the formula (Brigham, Houston, 2004, p. 89):

$$P/E = \text{market price of one share/earnings per one share.}$$

RoE indicator can be counted by the formula (Brigham, Houston, 2004, p. 88):

$$RoE = (\text{net income/shareholder's equity}) \times 100\%.$$

Net income is assumed to be a surplus arising after deducting every cost and tax from revenues. Shareholder's equity stands for the capital that have been contributed to the company by its possessors. It indicates the level of efficiency of 1 unit of equity, and answers the question how profitable shareholder's money is. With high levels of ROE, the increased dividend payment is more probable and, of course, the prospects of development (by further investments) are by far brighter (Begg, Fischer, Dornbusch, 2007, p. 173; Gajdka, Walińska, 2000, pp. 201–220; Brigham, Houston, 2004, pp. 77–87, 89; Brealey, Myers, 1999, pp. 1076–1090).

Second, in the portfolio analysis, Capital Asset Pricing Model (CAPM) and Arbitrage Pricing Theory (APT) have been taken into consideration. Third, in the technical analysis, Relative Strength Index (RSI) and Exponential Moving Average (EMA) have been taken into account. Each stock has been examined with those factors separately.

To give an example, from the banking sector, 12 companies have been tested one by one. PEKAO, PKO BP, GETIN, BZWBK, and others have been assessed separately by P/E, RoE, CAPM, APT, RSI, and EMA. When one bank came through the counting of P/E, the next step was to obtain the value of RoE. Then, the expected rates of return from CAPM and APT models have been estimated. Afterwards, the technical analysis indicators have been calculated. When it was finished, the process for the next firm began, for example, MILLENIUM, with its P/E and RoE ratios, etc. The calculations have been performed for all companies from the industry.

By calculating those factors the survey enters a new phase. The values of P/E Ratio and RoE have been downloaded directly from the web financial portals, such as bankier.pl and money.pl. Certainly, they have been calculated with compliance to general rules and formulae.

Estimating the expected rates of return in CAPM and APT, the methods of portfolio analysis, are much more time-consuming. First of all, there have been daily and weekly charts prepared, containing data of stock exchange quotations for the studied companies, as well as WIG index. The time range embraced years from 2000 to 2006. The data derives from stooq.pl. Some stocks have data in a daily frame and some have in a weekly frame, owing to the fact that sometimes daily data were invalid, it could have led to the failures in research and misinterpretations. Nevertheless, the basic frame is daily, and in overwhelming majority of examples, daily charts have been used. There are only 2 columns needed: the date of session and the closing price. Next, the percentage changes of the price from one session to another have been counted for each company. Afterwards, it was possible to calculate coefficients of the CAPM model with the use of the regression model. Subsequent calculations have been based on 2 parameters: b_1 and b_0, which have been crucial in the next step – counting the expected rate

of return. The method to do so utilizes the standard formula of CAPM. Parameters have been adjusted to Polish conditions.

$$R = R_f + \beta(R_m - R_f),$$

where:

- R – expected rate of return from the stocks of a particular company,
- R_f – rate of return from risk-free assets obtained by investing in Polish yield bonds,
- R_m – market rate of return, the average rate of return of Polish capital market index – WIG from the date of its setup to the end of 2006,
- β – Beta coefficient of stocks.

The rate of return from risk-free investments (R_f) is assumed to be the return of 2-year bonds the Polish government issued in the end of 2006. As a result, an intercept – b_0 is unused. The parameter ($R_m - R_f$) is said to be the risk premium. Investors buying stocks instead of treasury bills, for instance, tend to gain additional return. However, they do so at the expense of taking a much higher risk, that is reflected by a much higher price volatility than in the case of bonds or treasury bills. The calculation schema is used for each company. By CAPM model, it is possible to determine the probable future rate of return of particular stocks in 2007 marked as 'R' in the formula.

Quite the same method is used for designating the shape of APT. The difference is that quarterly data is in use instead of daily and weekly data. It is because there is no stock index that companies are compared to, but there are: Gross Domestic Product (GDP) growth rate, a rate of inflation, unemployment rate, and lombard rate whose changes are determined and published quarterly. Like in the case of the parameters of CAPM, to calculate 4 parameters, b_1, b_2, b_3, b_4, the regression model has been used. The risk free rate of return plays a role of b_0, as in the previous example of CAPM. To estimate the outcome of this model, the forecasted values of GDP growth rate, a rate of inflation, unemployment rate, and lombard rate (set by the National Bank of Poland) are required. The values taken for the needs of this survey occurred in the real economy in Poland in the first quarter of 2007. Of course, these values were not known at the end of 2006, so instead, estimations have been used. This problem has been thoroughly described in subsection 1, about the dilemmas of linking fundamental, portfolio, and technical analyses. When this operation comes to an end, it is possible to calculate the final result through the APT formula adjusted specifically to the Polish conditions:

$$R = b_0 + b_1 \times R_1 + b_2 \times R_2 + b_3 \times R_3 + b_4 \times R_4,$$

where:

R – expected rate of return of the asset in 2007,
b_0 – risk-free rate of return of Polish yield bonds,
R_1 – the change of GDP rate in Poland,
R_2 – unemployment rate in Poland,
R_3 – inflation rate in Poland,
R_4 – lombard rate (the income that Polish Central Bank receives in exchange for lending commercial banks money secured on securities),
b_1 – rate of return vulnerability of a stock to changes of GDP,
b_2 – rate of return vulnerability of a stock to an unemployment rate,
b_3 – rate of return susceptibility of a stock to an inflation rate,
b_4 – rate of return susceptibility of a stock to a lombard rate.

On the basis of those parameters, the expected rate of return of each stock in 2007 is worked out.

The last but not least stage is the technical analysis with its indicators – RSI and EMA. The data source for these indicators is a bossa.pl website, and the ISPAG (program for chartists) available there. RSI value is taken from the last session of 2006. It is calculated by the formula:

$$\text{RSI} = 100 - [100/(1 + RS)],$$

where RS – the average value of increase of closing prices for a chosen number of days divided by the average value of decrease of closing prices for a chosen number of days.

RSI points out whether stocks of a particular firm tend to be at the moment in the buying spree or are completely sold out. Interaction between RSI and EMA helps finding shares in upward trends being in the local, short-term bottoms. The formula of counting EMA is as follows:

$$\text{EMA} = 2 \times P_c/(N + 1) + \text{EMA}_p \times [1 - 2/(N + 1)],$$

where:

N – number of days in EMA,
P_c – the newest price,
EMA_p – value of EMA on the previous session.

It is specifically designed to depict relative variation between EMA in 5-week horizon (EMA5) with EMA in 25-week horizon (EMA25). The values of EMA5 and EMA25 indicators were also found in bossa.pl webpage. The whole data package and calculation is presented in the attachment.

The examination has given results for every share. Each factor at this time has its own ranking which are later summed up together. These rankings are created accordingly to the assumptions. When one sector has been finished, another sector starts to be tested.

By the time the analysis rankings are shown, the factors rankings must be created. The methodology of assigning the companies specific places in those rankings is as follows:

- for P/E ratio – the highest rank is for the company with the lowest P/E,
- for RoE – the highest the income falling on the equity, the highest the place of the company in a ranking,
- for CAPM and APT – the highest rate of return, the highest the rank,
- for RSI – the preferred firm is the one with the RSI lowest value,
- for EMA – the preferred company is the one with the EMA highest value which signifies the strength of the growing trend.

Rankings of factors are essential for creating intra-sector rankings. While carrying out a survey, there are P/E and RoE rankings created for the fundamental analysis, CAPM and APT rankings for the portfolio analysis, and RSI as well as EMA rankings for the technical analysis. There are 7 rankings created for every sector. It is crucial to stress the acronyms used in this article. There are several abbreviations for portfolios created by the use of the tools of the fundamental, portfolio, and technical analysis:

FA = portfolio of the fundamental analysis,
PA = portfolio based on the portfolio analysis,
TA = portfolio based on the technical analysis,
FA + PA = portfolio based on the joined fundamental and portfolio analysis,
FA + TA = portfolio based on the joined fundamental and technical analysis,
PA + TA = portfolio based on the joined portfolio and technical analysis,
FA + PA + TA = portfolio based on the joined fundamental, portfolio, and technical analysis.

For the portfolios based on the fundamental analysis, the portfolio analysis and the technical analysis, there are FA, PA, and TA acronyms created respectively. For the portfolios based on joined analyses, ‘ + ’ sign has been used to emphasize the link between them. Thus FA + PA, FA + TA, and PA + TA stand for the portfolios based on the fundamental and portfolio analysis, the

fundamental and technical analysis, and the technical and portfolio analysis respectively. Hence, the portfolio based on the 3 joined analyses – fundamental, portfolio, and technical – has FA + PA + TA abbreviation.

Finally, each sector has its own 7 rankings: FA, PA, TA, FA + PA, FA + TA, PA + TA, FA + PA + TA. The rankings have been organized in several stages. Firstly, the companies selected for the research form a sequence, one by one, according to the crucial conditions arranged in the previous subsection. ING bank, for instance, has the lowest value of P/E, so it has been on the first place and has received 1 point. KREDYT BANK has been second and has received 2 points. NORDEA has been third and has received 3 points, etc. GETIN, the worst company in this case, has received twelve points. Similarly, GETIN in RoE ranking has taken the last place, because it has had the lowest RoE – it has been given 1 point. PKO BP, second, has been given 2 points, PEKAO has been third and has received 3 points. NORDEA has got 10 points, BPH – 5 points, and so on. Next, the sum of P/E and ROE points has been calculated. KREDYT BANK, for example, has been second in P/E factor and has taken a lead in ROE table – this bank has got 2 + 1 = 3 points. BOS has been fifth in P/E and eleventh in ROE – it has received 5 + 11 = 16 points. In the same way, points for PA and TA have been calculated.

PKOBP topped the portfolio analysis ranking (PA) owing to the fact that it has achieved the second place in APT ranking, and the first place in CAPM ranking, so its score summed up to 3 points. For technical analysis ranking (TA), the positions in RSI and EMA rankings have been taken into account, and the number of points have been added up. BPH has been sixth in both classifications, so it has received twelve points and with this result has been fourth in TA classification.

For calculations of portfolios FA + PA, FA + TA, PA + TA, and FA + PA + TA not only values for every analysis have been counted, but also they have been summed up with each other. In FA + TA ranking, BRE Bank has taken the sixth place, because it has taken the tenth place (with 17 points) in FA, and the third place (10 points) in TA, so its general result has equalled 27 points. The most sophisticated event occurs in the case of FA + PA + TA, where summing up the outcomes of 3 rankings of the analysis is essential. MILLENIUM BANK has taken the eleventh place in FA with 17 points, the fifth place in PA with eleven points, and the tenth place in TA with 16 points. On the whole, it has received 11 + 17 + 16 = 44 points, and the ninth place in the total ranking (FA + PA + TA) embracing all the analyses.

Now, it is time to describe the fifth stage of the research. At this point, the companies having taken first places in their rankings have been included in diversified portfolios. These rankings have been created by putting firms from different sectors together.

Because there are 6 industries examined, there are also 6 stocks in each diversified portfolio. Diversification means that the investment risk is decreased by means of allocating capital in different assets from various industries. If correlation of such assets is lower than 1, the total risk of the portfolio wanes. This statement derives from Harry Markowitz's Portfolio Theory (Markowitz, 1959). There are 2 types of diversification: horizontal and vertical. The horizontal effect of diversification occurs by means of the increased number of companies in a portfolio. The second one happens by the use of the fundamental analysis, for example, by the selection of firms from different sectors, and a long-term investment horizon (Tarczyński, Łuniewska, 2004, pp. 55–59). In this article, both approaches have been implemented. It is assumed that portfolios are diversified so their risk should be minimized. Every stock in a portfolio has the same percentage share in the portfolio – 16.67%. Other 7 portfolios have been created, having the names of the analyses assigned: fundamental analysis (FA), portfolio analysis (PA); technical analysis (TA); fundamental and portfolio analysis (FA + PA); fundamental and technical analysis (FA + TA); portfolio and technical analysis (PA + TA); portfolio of joined fundamental, portfolio, and technical analysis (FA + PA + TA). However, their composition is by far different. They are composed only of the firms which have topped rankings of specific analyses in each sector. It should guarantee that from each sector, the companies with the most favourable values of indicators are chosen. Not only in this sense is the diversification useful, but also due to the lowered total risk of a portfolio.

A detailed statement of results of individual portfolios has been presented in the next subsection.

3. Research results

This subsection presents the essence of the research – the composition of 7 portfolios and their rates of return. The portfolios have been established on the grounds of the rankings in subsection 3, where both companies' return rates and the rate of return of the whole portfolio are studied. It is also discussed which representative of a particular industry plays the biggest role in improving or deteriorating the total result. Each portfolio consists of 6 companies from different sectors. There is 1 representative in each portfolio from each sector: banking, metallurgical, the primary and fuel, construction, food, and other services. It is assumed that each company has the same stake in the portfolio – 16.67%. Therefore, the average rate of return on all the companies included in the portfolios can be treated as equal to the return on the whole portfolio.

Two crucial indicators created the portfolio of fundamental analysis (FA): P/E Ratio and RoE. Their values are presented in Table 1. FA portfolio has been created by selecting the companies from the first places of the fundamental analysis rankings. These rankings have been a combination of P/E rankings and RoE rankings in each sector. FA portfolio consists of 6 companies: Kredyt Bank, Mostostal Zabrze, Stalprodukt, MOL, Wawel, and DGA. Their rates of return can be compared with WIG rate of return which amounted to 10.39% in 2007.

Table 1. Indicators values of stocks included in the fundamental analysis portfolio

Company	P/E	ROE (%)
KREDYT BANK	12.55	22.37
MOSTOSTAL ZABRZE	7.42	57.96
STALPRODUKT	13.73	47.93
MOL	0.07	30.52
WAWEL	9.12	32.81
DGA	15.54	15.95

Source: own elaboration based on the data from bankier.pl.

At this point, the values of consecutive factors in every analysis such as P/E, RoE, CAPM, APT, RSI, and EMA have been counted. Next, the rankings of these indicators have been prepared (inside each sector), which were necessary to enable creating separate rankings of analyses, as well as the rankings based on joined 2 or 3 analyses. The fifth stage concerned the formation of diversified portfolios, which consisted of 1 company from each sector. As a result, the diversified portfolios include 6 firms, owing to the fact that there have been 6 sectors.

Table 1 presents the values of these factors for all the chosen companies. The lowest P/E in the portfolio is recorded by MOL (Hungarian oil enterprise) and MOSTOSTAL ZABRZE, which also has the highest RoE. On average, P/E and RoE value has amounted to 9.74 and 34.59, respectively. The spread between the firms with the highest and the lowest P/E and RoE, is quite big in both categories. It is interesting to note that in the case of KREDYT BANK, MOSTOSTAL ZABRZE, and STALPRODUKT, RoE has been the crucial factor, because they have won the first places in RoE rankings, and further places in P/E ranking.

The only company that provided the negative rate of return in the fundamental analysis portfolio (FA) –6.71% has been DGA. On the other hand, the rest of the companies have increased the value of portfolio. The highest returns (94.64% and 40.23%) have been recorded in MOSTOSTAL ZABRZE and KREDYT BANK case, respectively. Total return of the FA portfolio has amounted to 27.26%, and only 2 stocks did manage to give higher yields.

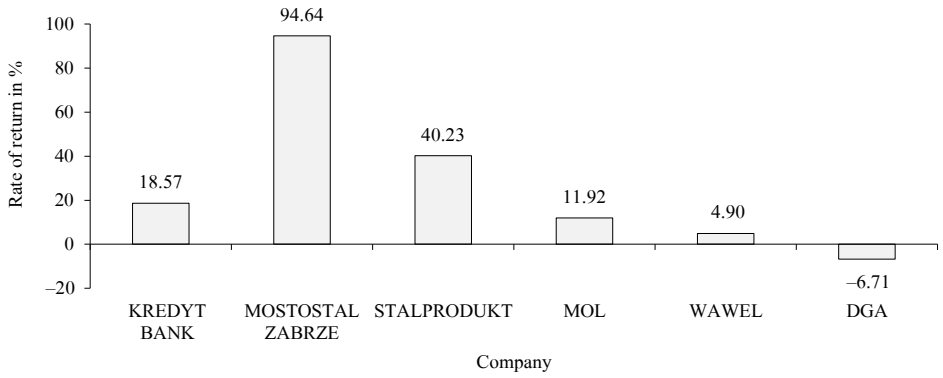

Figure 2. Yearly rate of return of companies in 2007 composing fundamental analysis portfolio

Source: own elaboration based on the data from stooq.pl.

Two methods had an impact on the creation of the portfolio based on the portfolio analysis (PA): CAPM and APT. PA portfolio has been created by selecting the companies from the first places of portfolio analysis rankings. PA portfolio consists of 6 companies: PKO BP, MOSTOSTAL EXPORT, BORYSZEW, KGHM, MIESZKO, and SWISSMED.

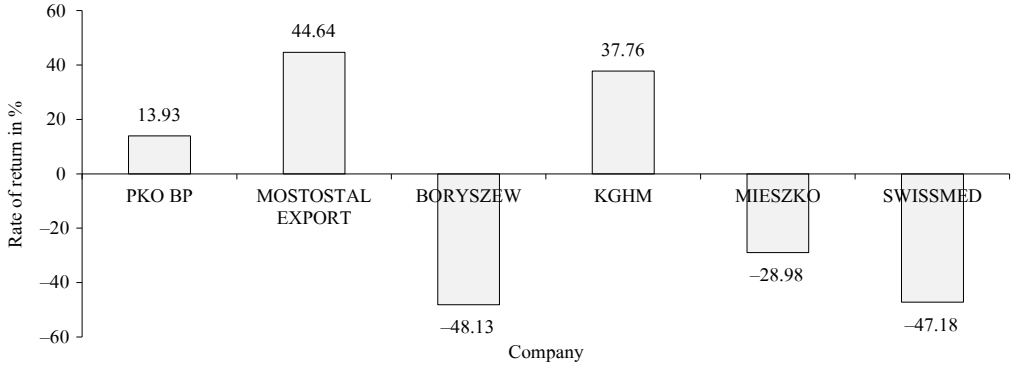

Figure 3. Yearly rate of return of companies in 2007 composing portfolio analysis portfolio

Source: own elaboration based on the data from stooq.pl.

It is clearly visible that the results have been unequal to MOSTOSTAL EXPORT rate of return amounting to 44.64%, and BORYSZEW huge negative return about 48.13%. Three of those companies have brought positive returns, and other three have brought negative returns, such as very serious –47.18% of SWISSMED. Very high rate of return (37.76%) has

recorded KGHM, which operates on copper market. The total result of the portfolio amounts to –4.66%. PKOBP, MOSTOSTAL EXPORT, and KGHM returns have been above the average. However, MIESZKO – the producer of sweets, BORYSZEW – the metallurgical company, and SWISSMED from services sector, have presented sub-zero returns.

Specifically, the expected rates of return, which are shown in Table 2, in APT case have been by far higher than in CAPM, and it seems that CAPM indications can be more reliable. The average rate of return of WIG in years 1991–2006 was 16.11%, and the presumably expected rates of return calculated by CAPM model may be more reasonable as they are not higher than 20%. Generally, the companies listed in Table 2 have presented better results in CAPM rankings than in APT rankings. Particular attention ought to be paid to SWISSMED. Its CAPM result is the lowest in comparison to other companies, and its APT expected rate of return is the highest. It has been selected to the PA diversified portfolio thanks to this result, exactly, because it was also the highest score in other services sector.

Table 2. The expected rates of return of stocks (in %) included in the portfolio based on the portfolio analysis

Company	CAPM	APT (%)
PKO BP	18.37	168.63
MOSTOSTALEXP	15.02	161.16
BORYSZEW	9.01	165.90
KGHM	19.73	32.45
MIESZKO	7.42	37.57
SWISSMED	4.73	171.38

Source: own elaboration based on the data from bankier.pl.

Two indicators created the portfolio of technical analysis (TA): RSI and EMA. TA portfolio has been created by selecting the companies from first places of technical analysis rankings in each sector. The rankings have been prepared separately for each sector. These rankings have been a combination of RSI rankings and EMA rankings in each sector. TA portfolio consists of 6 companies: PKOBP, PROCHEM, STALPRODUKT, MOL, KOFOLA, and PEKAES. Two of those mentioned have not been good investments with rate of return below zero: PROCHEM –30.77% and PEKAES –11.43%. Portfolio return has totalled 12.68%. It is below 4 companies returns, especially for KOFOLA with 52.17% and STALPRODUKT with 40.23%. KOFOLA was by far a better investment target than WAWEL and MIESZKO from food industry in the previous portfolios. The lowest has been the value of RSI, the highest firm position in ranking. The first place in EMA ranking was taken by the company having the highest value of EMA.

The purpose of such positioning was to mark the firms which have been moving in growing medium-term trends, and its price has been relatively reduced in the short-term.

It was like reaching a tough consensus due to the fact that these 2 factors many times showed contradictory indications. PROCHEM, for instance, took the second place in RSI ranking, and just the tenth place in EMA ranking (amongst 14 companies).

The company in a very strong upward trend would have at the same time a very high value of RSI and EMA. In consideration of a rather favourable stock market situation in 2007, RSI values have been believed to point out attractive prices levels after corrections. RSI and EMA values for companies are shown in Table 3. Enterprises rates of return are presented in Figure 4.

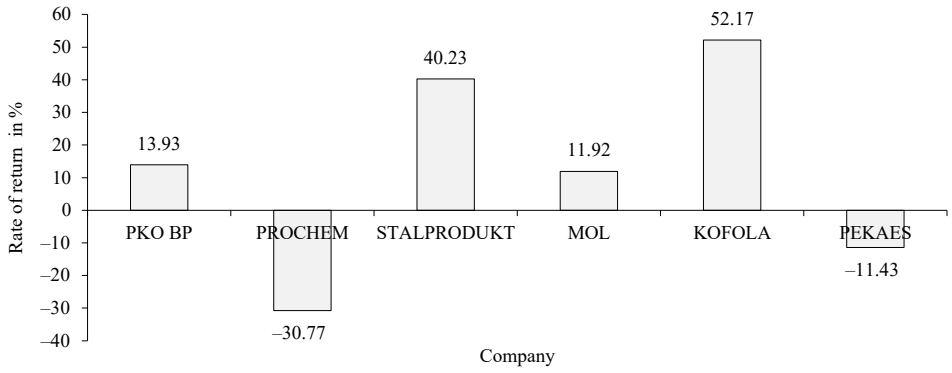

Figure 4. Yearly rate of return of companies in 2007 composing technical analysis portfolio

Source: own elaboration based on the data from stooq.pl.

Table 3. Indicators value of stocks included in technical analysis portfolio

Company	RSI	EMA
PKO BP	36.65	0.12
PROCHEM	46.97	0.14
STALPRODUKT	56.72	0.25
MOL	59.55	0.03
KOFOLA	46.96	0.06
PEKAES	29.04	–0.02

Source: own elaboration based on the data from bankier.pl.

These results of portfolios have been created by the use of separate analyses. In this place, matched application of analyses is considered. This portfolio creation is based on the synergy

of 2 analyses: fundamental and portfolio (FA + PA). As a consequence, it consists of 4 different factors – P/E, RoE, CAPM, and APT, that had an equal influence on selecting the companies to the eventual shape of the portfolio. Every portfolio is alike – it includes 6 companies, though they are from various sectors. PKO BP, MOSTOSTAL ZABRZE, IMPEXMETAL, KGHM, WAWEL, and DGA have made up this portfolio. The prices of 5 stocks rose within the space of 1 year from the beginning of 2006 to the beginning of 2007. Moreover, MOSTOSTAL ZABRZE has skyrocketed by circa 95%. The yields of KGHM, IMPEXMETAL and PKOBP have also soared, and have exceeded decidedly the yield of the whole market average – WIG index, whose rate of return amounted to 10.39%. Relatively low was the outcome of WAWEL, which has risen only by 4.9%, so it has only slightly outstripped the inflation rate in that time which came to 2.2%. DGA shares price have decreased by 6.71%, being the worst result in this group. In general, the portfolio has earned for the potential investor nearly impressive 30%, and it has not been caused merely by the outstanding result of MOSTOSTAL ZABRZE, because there have been at least 2 stocks with very satisfactory yields too. Interestingly, a merger of the fundamental analysis portfolio (FA) and the portfolio based on the portfolio analysis (PA), resulted in the appearance of 3 firms from FA portfolio and 2 firms from PA portfolio.

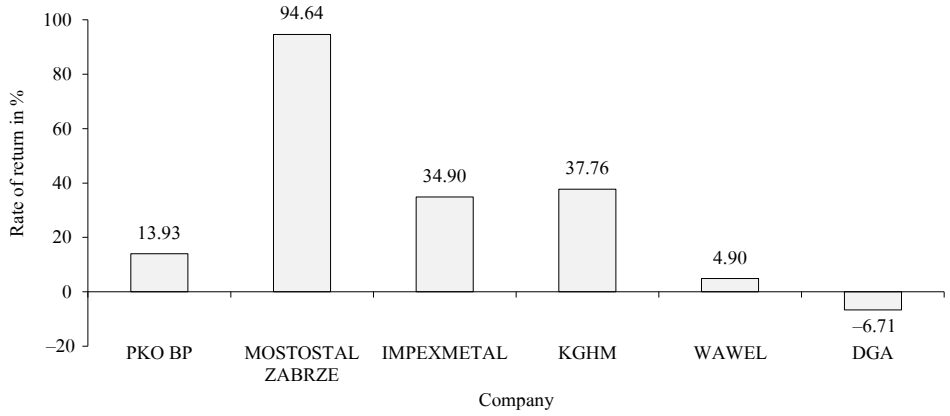

Figure 5. Yearly rate of return of companies in 2007 composing portfolio of joined fundamental and portfolio analysis

Source: own elaboration based on the data from stooq.pl.

One company, i.e. IMPEXMETAL, has been included in none of these. Surprising can be the presence of DGA in the portfolio shown in Table 4, owing to the fact that it had low

expected rates of return calculated by CAPM and APT. Enterprises rates of return are presented in Figure 5.

Table 4. Value of indicators and expected rates of return of stocks (in %) included in the portfolio based on the joined fundamental and portfolio analysis

Company	P/E	ROE (%)	CAPM (%)	APT (%)
PKO BP	21.89	21.32	18.37	168.63
MOSTOSTAL ZABRZE	7.41	57.96	14.40	198.06
IMPEXMETAL	0.35	20.73	5.57	126.52
KGHM	5.64	41.08	19.75	32.45
WAWEL	9.12	32.81	6.27	118.07
DGA	15.54	15.95	6.26	481.46

Source: own elaboration based on the data from bankier.pl.

By matching another mix of 2 analyses: fundamental and technical, a new portfolio can be created which is named FA + TA, and consists of KREDYT BANK, POLIMEX MOSTOSTAL, STALPRODUKT, MOL, WAWEL, and DGA. Earlier, 4 factors with the same significance have been taken into account: P/E, RoE, RSI, and EMA.

As presented in Figure 6, there have been 5 companies whose share price rose during the year 2007, and 1 company whose share price deteriorated the general return of FA + TA portfolio. Table 5 shows values of subsequent ratios for the companies. Especially good has occurred to be POLIMEX MOSTOSTAL rate of return, and return of STALPRODUKT from construction and metallurgical sector, respectively. Both yields have amounted to marvellous 40%. As shown in Figure 6, particularly low has been the return of DGA whose share price has plummeted by 6.71%. In total, portfolio has earned 18.32% so the difference between FA + TA and DGA returns came to more than 25%. Yet again, the highest rates of return were presented by the companies from construction and metallurgical sector.

Very interesting to note is the fact that in the portfolio applying 2 analyses, 5 companies have been included from the fundamental analysis portfolio (FA), and there have been no companies from the technical analysis portfolio (TA). As a consequence, the technical analysis had a little impact on the final selection. POLIMEX MOSTOSTAL has not appeared in any other portfolio.

Portfolio PA + TA, on the contrary to the previous ones, matched the technical and portfolio analyses. Surprisingly, the results have been by far worse than it could be expected. It is clearly visible in figure 6 that as many as 3 companies have brought negative rates of return. BORYSZEW share price from metallurgical sector declined in the time frame that is

considered in the study by 48%, WILBO share price from food industry declined by 23.6%, and SWISSMED stock price from other services industry dropped by 47.18%. Consequently, BORYSZEW and SWISSMED have been the true leaders in falls, and they have contributed considerably to a very low rate of return of their portfolios. An investor who put money in that way in the companies mentioned above at the beginning of 2006, and sold all papers after the year, would have lost 3.76%. Of course, it might seem to be not a very poor result in comparison to 48% cut in the prices of BORYSZEW, but, in the meantime, WIG went up by 10.39%.

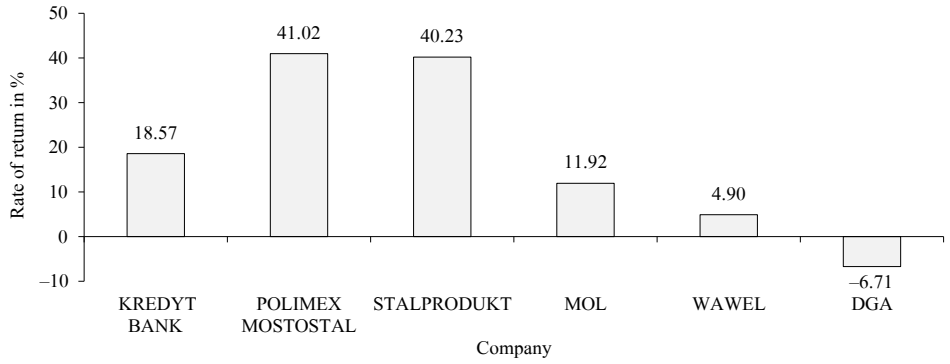

Figure 6. Yearly rate of return of companies in 2007 composing portfolio of joined fundamental and technical analysis

Source: own elaboration based on the data from stooq.pl.

Table 5. Indicators value of stocks included in portfolio based on the joined fundamental and technical analysis

Company	P/E	ROE (%)	RSI	EMA
KREDYT BANK	12.55	22.37	54.18	0.13
POLIMEX	1.56	17.65	47.31	0.15
STALPRODUKT	13.73	47.93	56.72	0.25
MOL	0.07	30.52	59.55	0.02
WAWEL	9.12	32.81	44.27	0.01
DGA	15.54	15.95	59.63	0.03

Source: own elaboration based on the data from bankier.pl.

What improved a PA + TA portfolio general outcome was a high return of MOSTOSTAL EXPORT, PKO BP, and KGHM. The first of the recalled firms has recorded 44.64% surge in stock prices; KGHM has risen quite similarly by 37.64%, and PKOBP has risen by 13.93%.

a thorough analysis of PA, TA, and PA + TA portfolios composition leads to the similar interpretations as in the portfolio presented in the previous example. Important to emphasize is the fact that only PKO BP has been the representative of TA portfolio. PA portfolio has included 5 firms with the exception of WILBO. Detailed information about the factors values of each company has been shown in Table 6.

Discussing the results of using the synergy effect of the fundamental, portfolio, and technical analyses proved to be a crowning of the whole survey. First and foremost, it is important to emphasize that it has been based on 6 companies from different sectors, and, what could take some observers totally aback, none of the shares price slumped. The situation that each company gave a positive return is precedential as it has not occurred in any previous portfolio.

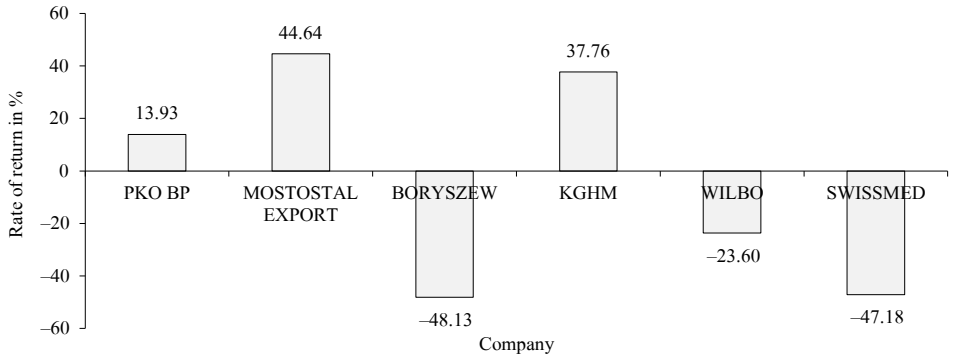

Figure 7. Yearly rate of return of companies in 2007 composing portfolio of the joined portfolio and technical analysis

Source: own elaboration based on the data from stooq.pl.

Table 6. Values of indicators and expected rates of return of stocks (in %) included in the portfolio based on the joined technical, and portfolio analysis

Company	CAPM (%)	APT (%)	RSI	EMA
PKO BP	18.37	168.63	36.65	0.124
MOSTOSTALEXP	15.02	161.16	41.4	0.006
BORYSZEW	9.01	165.90	27.02	–0.058
KGHM	19.71	32.45	25.13	–0.062
WILBO	44.52	2.26	47.58	0.067
SWISSMED	4.73	5,531.45	30.89	–0.148

Source: own elaboration based on the data from bankier.pl.

The composition of this group is as follows: PKOBP, MOSTOSTAL ZABRZE, STALPRODUKT, KGHM, WAWEL, and ZASTAL. These companies have been selected on the grounds of P/E, RoE, CAPM, APT, RSI, and EMA. As a consequence, this portfolio has been based on the broadest scope of information. It is significant to mark that 5 of those companies played a significant role also in other portfolios. MOSTOSTAL ZABRZE, for instance, was a part of the fundamental analysis portfolio (FA) and the portfolio based on the fundamental and portfolio analysis (FA + PA), so with the rate of return of almost 95%, it has improved the outcomes of the 3 mentioned portfolios. ZASTAL, a company that has not appeared in any other portfolio, had an impact on the total result with the yield amounting to 25%. The whole portfolio return totalled 36%, and it is the best result amid portfolios. Rates of return of consecutive enterprises are presented in Figure 8.

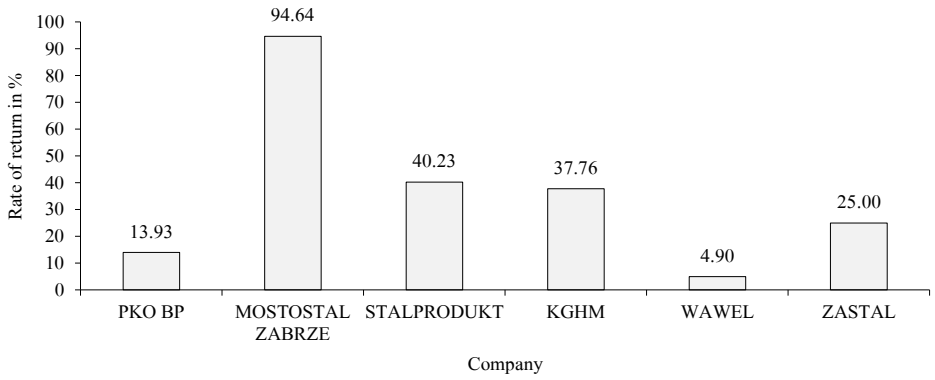

Figure 8. Yearly rate of return of companies in 2007 composing the portfolio of the joined fundamental, portfolio and technical analysis

Source: own elaboration based on the data from stooq.pl.

PKO BP has been selected mainly due to a high score in CAPM and APT rankings, quite the opposite was with STALPRODUKT. The positions of MOSTOSTAL ZABRZE in RSI and EMA rankings were very low. WAWEL, the manufacturer of chocolates, was the specific example because it did not take any first place in 6 rankings. However, it did take high positions in each ranking – not lower than the sixth place. Similarly, ZASTAL won only EMA ranking, but still, it has been granted enough points to get to the final FA + PA + TA diversified portfolio.

BORYSZEW and KGHM have been the representatives of the portfolio based on the portfolio analysis. PKO BP and STALPRODUKT have occurred also in the technical analysis portfolio. MOSTOSTAL ZABRZE, STALPRODUKT, and WAWEL took place in the

fundamental analysis portfolio. This discussion can lead to the conclusion that the fundamental analysis played the most significant role in selecting firms to subsequent portfolios.

The aim of this subsection is to outline the final rate of returns of the 7 portfolios, and to compare them with each other and with the percentage yearly change of WIG index. The sixth stage of the research conducted in this subsection is its core. At this point, the results of the portfolios are compared to each other and to WIG.

Table 7. Values of indicators and the expected rates of return of stocks (in %) included in the portfolio based on the joined fundamental, portfolio, and technical analysis

Company	P/E	ROE (%)	CAPM (%)	APT (%)	RSI	EMA
PKO BP	21.24	18.48	18.37	168.63	36.65	0.1238
MOSTOSTALZAB	7.41	57.96	14.45	198.06	70.72	0.2054
STALPRODUKT	13.73	47.93	4.85	160.32	56.72	0.2525
KGHM	5.64	41.08	19.72	32.45	25.13	–0.0623
WAWEL	9.12	32.81	6.27	118.07	44.27	0.0086
ZASTAL	37.66	1.88	6.26	481.46	72.43	0.5357

Source: own elaboration based on the data from bankier.pl.

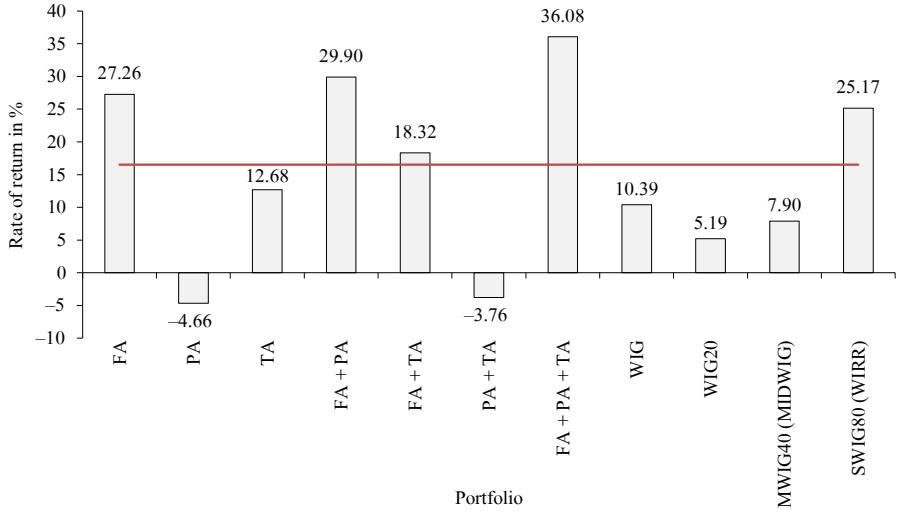

Figure 9. Portfolios and indices rate of return compared with the average rate of return of the seven portfolios

Source: own elaboration based on the data from stooq.pl.

The issue worth bearing in mind is that there have been 19 companies amidst the 59 examined in the survey which have won their rankings in separate categories, and have gone further to the final portfolios. To put it another way, there have been 19 firms (32% of the total number of the companies) which have had an influence on the eventual results of the portfolios.

Interestingly, in 2 sectors, there have been no companies with negative yields, i.e. banking sector and the primary and fuel sector. Such an effect has been caused presumably by the favourable economic conditions in the period of time that is taken into consideration. When it comes to banks, boosting economy in 2003–2007 was the propeller for credit demand. As a consequence, growing interests payments improved the financial results of banks. Satisfactory results have been observed in construction industry and metallurgical industry as well, however, they both had 1 company that has not been a profitable investment. Food sector results were rather opaque with no clear trend movements. On the one hand, WAWEL and KOFOLA gave handsome yields, but, on the other hand, WILBO and MIESZKO rates of return have been sub-zero. Assessing this particular industry as successful or not, is impossible in this case. There is no denying that other services sector quoted the least satisfactory results. Adding 3 of 4 companies led to the deterioration of the portfolios results. Only ZASTAL from this sector produced yield on its shares.

Figure 9 illustrates the percentage yearly rate of return of portfolios, and the percentage yearly change in Polish stocks indices value (such as WIG) in 2007. At first sight, the wide spread between the rates of return of different groups of companies can be noticed. It has varied from –4.66% for PA portfolio and –3.76% for PA + TA portfolio to 27.26% for FA portfolio, 29.9% for FA + PA portfolio, and 36.08% for FA + PA + TA portfolio. In the middle of the rankings, there have been 2 portfolios: TA and FA + TA with the rates 12.68% and 18.32%, respectively. In addition to this, the rate of return of the benchmark – WIG amounted to 10.39%. It seems that some outcomes remained higher than the score of the benchmark, i.e. FA, TA, FA + PA, FA + TA, and FA + PA + TA. In contradistinction to this, PA and PA + TA portfolios not only have presented worse scores than WIG, but also their yields have been negative.

Furthermore, the line determines the average rate of return which has been based on the results of the 7 portfolios created in the survey. This average amounts to 16.54%. Four indices have been taken into consideration: basic WIG, which has been many times referred to in this article, WIG20 (benchmark of the 20 biggest and most liquid companies in the WSE), MWIG40 (benchmark of 20 medium companies, formerly MIDWIG), and SWIG80 (benchmark of 80 small companies, formerly WIRR). Apparently, the average outcome of the 7 portfolios has been by far better than the results of WIG, WIG20, and MWIG40. Only SWIG80 percentage

change has been higher. It would suggest that using the fundamental, portfolio, and technical analyses with the aim of creating a diversified portfolio was very successful. Especially efficient has occurred to be the mixed portfolio FA + PA + TA, which has been better than other portfolios, the average and indexes as well. WIG20 and MWIG40 has achieved quite poor scores with 5.19% and 7.9% rate of return, one by one. The worse have been only PA and PA + TA. The shareholders of small companies from SWIG80 have been gratified to see the high 25.17% rate of return. Four portfolios – FA, FA + PA, FA + TA, and FA + PA + TA – have recorded better results than the average.

Most of all, the decision whether to buy 1 of 7 portfolios or to buy an index unit would be obvious. Those groups of the companies whose total rate of return has been higher than the return of WIG, would be a great investment target, owing to the fact that it has been better than benchmark. So many people claim, badly or well, that it is likely to be similar in the future – this tendency will be stable. Of course, the scores are almost identical to the previous ones, but they do put an emphasis on the risk premium, which investors must consider before entering their investment. What is self-evident, is that FA + PA + TA company basket has recorded the largest premium above WIG – nearly 25%. The premium of FA + PA has been the second biggest.

Seven portfolios have been examined. Each portfolio has been created by the influence of 1, 2, or 3 analyses. What is most interesting, FA + PA + TA strategy (based on the joined fundamental, portfolio, and technical analysis) occurred to give the highest rate of return. It seems that in this particular case in which data has been taken from 2000 to 2006 and the method has been verified in terms of data from 2007, this strategy has unquestionably no rivals. Additionally, each of the companies in that portfolio has presented positive (above zero) rates of return, which has been a phenomenon. The rest of the portfolios have presented at least 1 company with negative rate of return. Such a result would suggest that using 3 of these analyses simultaneously may help investors in taking the right decisions about selecting the appropriate stocks into a portfolio.

The difference in rates of return between the first FA + PA + TA portfolio and the second in the ranking FA + PA is remarkable, and has amounted to 6.18%. The spread between the best 36.08% and the worst –4.66% result has been about 40.74%, so it is very high. Worth considering is the fundamental analysis separate impact on the rate of return. Each portfolio using the fundamental analysis has recorded handsome returns. Relatively the weakest has been FA + TA portfolio whose return has oscillated around the level of 18%. Other portfolios in which the fundamental analysis has been a part of choice criterion, has recorded better results. By contrast, other analyses has given considerably worse results. PA portfolio, for instance, was

the only one that has been on loss, in spite of the fact of having been built on the basis of one analysis only.

The separate use of analysis in the case of FA and TA portfolios, has been successful with rate of returns circa 27% for FA, and 12.68% for TA. Consequently, in this event, using PA analysis alone did not improve the result. Nor did it improve the result in case of PA + TA portfolio, which lost 3.76% of the initial value.

FA + PA and FA + PA + TA portfolios had very good results. However, the role of the portfolio analysis in improving the score of these 2 portfolios would be debatable. It seems that the statement that the fundamental analysis influence has been the greatest in these 2 examples would be more credible. On the one hand, the technical analysis used in TA, FA + TA, and FA + PA + TA portfolios has given satisfactory outcomes. But, on the other hand, the technical analysis mixed with the portfolio analysis in PA + TA portfolio led to losses. Consequently, the decision whether the technical or portfolio analysis should be used is a hard one, and requires a careful consideration. The results presented do not show unambiguously the effects of using them, that someone may rely on.

On the basis of this research, it is possible to pay special attention to the outcomes of the fundamental analysis, which, implemented in portfolios, has not returned wobbly results, but just the opposite, it has given the stability and improvement. The portfolio analysis alone has recorded the negative return of 4.66%. When the fundamental analysis has been added to the portfolio analysis creating FA + PA portfolio, a sudden hike in rate of return reaching almost 30% has appeared. So, the effect of synergy is clearly visible. The portfolio analysis alone has given a loss of the initial value of the company basket, whereas the fundamental analysis alone has given a positive return of 27%. Consequently in the case of PA, the improvement was huge and sharp, whereas in the case of FA, the improvement was little, but still positive. Quite a similar thing can be observed with the technical analysis. Although the technical portfolio (TA) has not recorded the negative rate of return, by adding to this the fundamental analysis, the score was even better. On balance, explicit elaboration of the effects of the technical and portfolio analysis application might cause difficulties.

Notwithstanding this, there are some interesting examples. FA + TA portfolio worked out 18.32% of yield. By adding the portfolio analysis to FA + TA, the total income has surged by 36.08%, creating the basket of shares with the highest return in the whole research. Not so spectacular, but still positive, has been the effect of implementing the technical analysis into FA + PA basket, which originally had 29.9% of yield, and when it was transformed into mixed FA + PA + TA, the return rose by circa 6 percentage points. Even though the quoted instances

are convincing, the clean impact of these analyses might be questioned. Finally, once again, the fundamental analysis proved to be useful when added to PA + TA portfolio with –3.76% rate of return. In this case, it has changed completely the results, creating FA + PA + TA portfolio with the best return – plus 36.08%.

Generally, when the results of the survey are studied, there is an irresistible impression that the fundamental analysis can improve the rate of return. No matter where it was added, it gave the benefit. However, the significance of assumptions taken must be remembered. These results have been achieved on the WSE in 2000–2007. Even not a very crucial change of several parameters, or a change of time scope would make the presented outcomes partly various. They differentiate the special market conditions in which some relations between analyses and their factors can be observed. According to Alexander Elder (1998), markets are still changing so it would not be appropriate and reasonable to rely on the outcomes of 1 survey only.

One of the universal questions that many investors tend to ask is whether they ought to build their own portfolios on the basis of the methods linked together, or not. The answer is not self-evident, but yet some conclusions might be drawn from the survey. Merely a quick glance required to realize the outstanding score of FA + PA + TA portfolio, is not enough to become aware of the difference between the individual use of the analyses, and the application of 2 linked analyses. As far as the fundamental, portfolio, and technical analysis is concerned, their portfolios has brought 11.76% of return on average. The linked analyses, i.e. FA + PA, FA + TA, and PA + TA have recorded yields of 14.82% on average, and above 3 percentage points higher than the average return of the individual analysis portfolio. It can also signify the meaning of linking various manners of investing.

There is another very intriguing matter, namely, that the average return rate of 6 portfolios has been higher than the percentage change of WIG, so it means that the general use of 3 analyses, with the 2 earlier mentioned factors in it, in some special market conditions in 2007, has ensured an additional rate of return.

In the end, conclusions can be reached. The outcomes can signify which connection of analyses could earn for the potential investors the highest amount of money. It can also be emphasized which connection in such market conditions would not create a profitable strategy, so which one should be avoided.

Summing up, it seems that the conducted research unveiled a lot of interesting information about implementing the fundamental, portfolio and technical analysis to build stock portfolios quoted on the WSE. It has been proved that using the analyses separately provided, on average, the lower rate of return than the application of the 2 matched analyses which have created

portfolios. Hence, the presumption that a multi-application of 3 linked analyses would form a crowning achievement, can be real. Finally, it occurred to be true that the mixed portfolio FA + PA + TA with the highest rate of return has taken the first place in the eventual ranking of the diversified portfolios. Its outcome made an impression of being not only higher in terms of rate of return than other portfolios returns, but more stable too. All stocks as elements of portfolio have ensured at least decent returns. Even the well-known stock exchange indices have brought in smaller advantages.

Nevertheless, the outcomes of the research can be very prone to the changes of assumptions. For instance, instead of P/E ratio in the fundamental analysis, Price/Book value ratio could have been used. One can make a conjecture that the effects of such a switch may reverse the picture of the fundamental analysis portfolio and other portfolios indirectly, too. Furthermore, it would be possible to apply a more short-term approach in the technical analysis. It can be done by changing an RSI parameter from 5 weeks to 2 weeks. Then, the system would concentrate more on short-term price movements. Additionally, applying this strategy in the following year, i.e. in 2008, in the times of severe economic crisis, would certainly affect the results in a detrimental way. Probably, all of the portfolios could lose a remarkable part of their value.

Conclusions

There are several methods of taking investment decisions described in this article. It must be stated that the fundamental, portfolio, and technical analysis constitute different approaches, which are convenient for different types of investors with various expectations and time horizons of their investments. Each of these methods has its advantages and disadvantages. Nevertheless, the research, which has been entirely devised by the author of this article, aimed at providing the specific combination of 3 analyses in order to optimize the performance of the portfolio. The drawbacks of one analysis has been covered by the virtues of the other analysis. Consequently, the chances of successful achieving investments goals have been made stronger.

With reference to the problem of this paper, it is very interesting to note that with the aim of maximizing the rate of return, the fundamental, portfolio, and technical analysis ought to be used with the equal impact on shaping the portfolio of companies. It has been emphasized in the research conducted in this paper that the simultaneous application of 3 analyses has given unambiguously positive results – the highest rate of return.

The study has proved that in certain economic conditions and with some methodological assumptions taken, application of 3 methods of taking investment decisions can have the positive

influence on the rate of return. Therefore, the broader scope of analysis tools may potentially help in building portfolios with high performance.

Referring to the aim of this article formulated in the introduction, the efficiency of the approach to link 3 analyses in years 2000–2007 on the WSE has been verified. The research has verified and realized the aim of this article. However, it takes place along with fulfilling a number of conditions and strict assumptions made. Moreover, the research hypothesis has been verified positively as the application of the 3 analyses is most advantageous.

Diversified portfolios have been created on the WSE using the data from 2000–2007. In this particular example, the simultaneous application of the fundamental, portfolio, and technical analysis had a distinct influence on the rate of return level of the portfolios. In this case, a special kind of synergy effect can be observed. Notwithstanding this, it is very significant to bear in mind that these results have been obtained in the peculiar market circumstances, on the bull and bear market, with many rigorous assumptions concerning the research, which could have had an impact on the results. In different conditions, many conclusions would vary considerably. On balance, the results of the research have to be interpreted only with precise premises.

The conditions determining the scope of this article concern tools application of analyses, the manner in which the portfolio of the companies can be diversified, the general situation on the stock market, macroeconomics indicators, and the position of the whole research on the WSE.

Another thing is the selection of time intervals in the research conducted, because it is bound to the vacillation of the economic situation. Additionally, it is related to the vast range of economic and non-economic factors which influence the real economy and the stock market as well. It can be a starting point for further research.

This article does not cover entirely the subject of application of the fundamental, portfolio, and technical analysis on the Polish stock market. There is a wide range of possibilities to conduct another research. For instance, other indicators from each analysis may be taken, and different sectors or companies may be selected. Additionally, the change in methodology of the survey might be implemented. But most of all, different time scope would be very interesting to apply, due to the disparate market conditions that can happen. Moreover, such an approach would be verified on the stock exchanges with the longer tradition, in the countries where capital market is deeply embedded in the structure of the economy, such as the United States, the United Kingdom, Germany, and Japan.

It is very significant to emphasize that the author has concentrated only on the rates of return of portfolios and has not taken risk into consideration. The lack of introduction of the risk term results in the method of classifying the portfolios. Consequently, portfolios cannot be named as 'efficient'. So, a portfolio with the highest rate of return may be believed as 'optimal' with the reference to assumptions taken. Before the Portfolio Theory was propagated, there had been a widespread belief that expected rate of return is the only criterion of investment decisions. Then, investors started to practice also the measurements of incertitude, such as variance or standard deviation, which are the measures of changeability (Wierzbicki, 1995, p. 18). Standard deviation is the square root of variance. It informs about the average difference between all the units in a particular group and the arithmetic average (Sobczyk, 2007, pp. 53–54). Notwithstanding this, in the research conducted in this article, the notion of risk does not constitute the subject to be measured. So, the diversified portfolios have not been created on the grounds of standard deviation, for example. Implementing these elements would also have considerable effects on the results. In such a case, not only the rate of return would rank each portfolio, but also the level of risk. The less risky an asset is, the more attractive investment could be.

It is significant to emphasize that the relation between the concurrent use of the 3 analyses, and the portfolio performance which occurred in the research for 2007 do not have only a theoretical value. It can be useful as a stepping stone for further research. Furthermore, such an approach may be applied by investors in order to build real portfolios of stocks. Of course, in such a case, it should be adjusted conveniently to the current market conditions. In similar economic situation as shown in the research, this strategy would have some chances of success.

When it comes to the Polish capital market, the issues raised by the author of this article will probably occur more frequently in the future, owing to the constant development of the WSE. Another thing worth mentioning is rising investors' knowledge and awareness about the existing methods of taking investment decisions, which will shift their focus on the professional manners of investing.

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