Investment portfolio management based on the study of the competitiveness of joint-stock companies

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Abstract

Investing into stock market effectively is possible only when based on scientifically sound methods for analysing investment instruments. The purpose of this study is to develop a method for selecting financial instruments for the formation of an investment portfolio of securities. The proposed method is based on the analysis of the competitiveness of joint-stock companies by identifying the market's capacity, the share price and the company's share in of the stock market turnover. Approbation of the developed method made it possible to identify investment-attractive shares quoted on the Warsaw Stock Exchange. The proposed method has potential to become a scientific basis for effective long-term investment on the stock market.

1. Introduction

Respective problems on the Polish market of goods and services make natural persons and legal entities seek new investment opportunities. The securities market may be an attractive place to invest temporarily available funds. The main requirement here is a balanced investment policy based on the use of scientific research methods.

According to the analysed literature, the problem of selecting financial instruments for the effective construction of the investment portfolio plays an increasingly important role in scientific circles.

Scientists, such as the following, among others, are trying to solve this problem:

– T. Węgrzyn in his article "Selection of companies for the portfolio using financial ratios and their relative growth rate – analysis in 2001–2010" [Węgrzyn, 2013]. The main advantage of the proposed method is the use of the relative growth rate; however, the number of analysed indicators, which amount to 26 in four different categories, i.e. profitability, liquidity, management efficiency and debt, makes the application of the method in practice very complicated;

– M. Tymiński and R. Zawiślak in the article "Bi-criterial choice of financial instruments for effective construction and optimization of portfolio on the capital market" [Tymiński and Zawiślak, 2008], which presents the concept of optimisation of the investment portfolio, but do not solve the problem of construction of such a portfolio and the method of selection of companies;

– B. Jabłoński in his article "The role of choice of groups of shares for the investment portfolio on the example of the Warsaw Stock Exchange in 1991–2009" [Jabłoński, 2010]. As the title suggests, the main subject of this study are only the so-called dividend companies. Such an approach is quite interesting, however, it does not make it possible to calculate other factors, such as price changes, market capacity and the company's market share.

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It is worth noting that in the above articles, as well as in other papers, all approaches and attempts to solve the problem of selecting companies for the investment portfolio can be divided into methods based on technical analysis [Schwager, 1999; Murphy, 1999] or fundamental analysis [Bulkowski and Thomas, 2012; Ritchie, 1996; Orlova, 2014].

The method proposed in the study attempts to combine these two research methods. The aim of the paper is to develop a scientific method of selecting financial instruments to build an effective portfolio of securities.

The subject of the study are shares of the companies in the banking sector listed on the Warsaw Stock Exchange. The above study is based on the analysis of statistical data from the Warsaw Stock Exchange (Retrieved from https://www.gpw.pl) and data available through the MT4 trading platform of the Polish Brokerage House TMS [Retrieved from https://www.tms.pl]. The period of the analysis is 1 January 2016–1 October 2017.

2. Method of company competitiveness assessment

The method of company competitiveness assessment proposed in this paper is based on an analysis of the attractiveness of financial investment instruments, namely shares. The proposed method is based on the analysis of the company's share in the securities market (which is both the result of the fundamental analysis – the answer to the question whether the company is a subject of interest of long-term investors – and the result of the technical analysis – since historical data on prices per share speaks of the impossibility of a transaction, which discourages traders from watching it and searching for places to buy or sell it), prices per share (technical analysis – in accordance with the main postulate of the technical analysis theory, the price of an investment instrument is the summation of all factors, including fundamental ones [Bulkowski and Thomas, 2012; Ritchie, 1996]) and market capacity (market demand). It is worth noting that the company's market share depends on the interest of investors and other capital market participants in trading the company's shares. This creates a situation of competition and rivalry in obtaining additional money for the development of the company by means of the securities market. However, this share depends not only on the activity of the company and the results of its own operations, but also on the capacity of the market itself (the amount of capital on the market, the number of large and small players and their activity in a given sector of the securities market).

The first stage (according to the proposed method) consists of finding the largest companies on the stock exchange, which have a significant market value in the sector of interest to the investor. All the data required for the analysis and establishing the investment policy in the market will be divided into basic and extended data. Basic data include: company name and its abbreviated form, date of listing on the stock exchange, number of shares issued. It is proposed to use as extended data the market and book value of the company, P/B ratio (price to book value), P/E ratio (price to earnings) and dividend rate.

According to the proposed method, the best shares for long-term investors are those of companies with a lower P/B ratio. Shares of companies with a P/B ratio below 1.5 may be useful in the investment portfolio. However, for the analysis of a given sector on the securities market, shares of companies with a higher P/B ratio may be taken into account due to their popularity among other investors.

Another indicator that should be used in the analysis of investment instruments on the securities market is the P/E ratio, showing the number of years needed until the profit generated by the company is equal to the invested capital.

Therefore, according to the presented theory, a company with a higher P/E ratio has too high expectations on the part of investors and a correspondingly higher price per share. On the other hand, shares of the company with a lower P/E ratio have more opportunities for potential price increase. The study proposes that companies with a P/E ratio above 20 should be eliminated from the investor's portfolio as such companies may have low operating income levels.

The dividend rate in this method is used as an additional indicator that may influence the investor's decision, however, it does not constitute its main factor.

The second stage of the study is to determine the point at which the market currently is: upper turning point, slowdown, recession, lower turning point, recovery, expansion. The answer to this question gives an opportunity to find the so-called big players on the market and to enter a new trend with them. Each cycle can be divided into smaller parts. Adjust your investment policy and find specific market entry points that are in line with the market trends and technical analysis principles.

Third stage of the study. The results of the third phase of the proposed research method form the basis for a final decision on the shares that are to be included in the investor's portfolio. The proposed method is based on modifications of the rules proposed by J. Bazarnik, T. Grabiński, E. Kąciak, S. Mynarski, A. Sagan on identifying the effects of price change, market capacity and the company's market share when conducting marketing research.

Therefore, the main formula to calculate the overall effect of the change in price per share, the market capacity and the market share of the company is as follows:

$$S_i = Q * U_i * P_i \qquad (1)$$

where: S_i – modified total value of shares turnover selected for the analysis of the company on the stock exchange, in monetary units; Q – market capacity – modified share turnover of all companies on the stock exchange selected for the analysis, in contractual units; U_i – share of a given joint-stock company in the total turnover of companies on the stock exchange selected for the analysis, %; P_i – modified price of the company's shares for the analysed period.

Since each company has its own price and the influence of each company on overall turnover differs, an additional unit of measurement, namely the notional number of shares, is necessary when calculating the company's market share. Under such assumption, the formula for calculating the overall market capacity is as follows:

$$Q = \frac{\sum (Q_i * P_i)}{1000} \qquad (2)$$

where: Q_i – turnover of the company selected for the analysis in the analysed period, number of shares.

The share of the company in the total turnover of the companies selected for the analysis is proposed to be calculated as follows:

$$U_i = \frac{Q_i * P_i}{Q} \qquad (3)$$

To calculate the share price for the analysed period (P_i), the method proposes to use four prices – the opening price, the lowest price in a given period, the highest price in a given period, and the closing price. Let's assume that these prices have equal weight. Therefore:

$$P_i = \frac{1}{4} P_{otw} + \frac{1}{4} P_{nn} + \frac{1}{4} P_{nw} + \frac{1}{4} P_{zam} \qquad (4)$$

where: P_{otw} – share price of the company, which is the opening price in the analysed period; P_{nn} – the lowest share price of the company in the analysed period; P_{nw} – the highest share price of the company in the analysed period; P_{zam} – share price of the company, which is the closing price in the analysed period.

In order to identify particular spheres of influence of other factors, namely changes in the market capacity, the company's share in trading on the stock exchange and changes in the share prices of individual companies, an effective chain based approach will be applied. This method is based on decomposition using an incremental form with the following formula

$$\Delta S = S_1 - S_0 = Q_i * U_i * P_i - Q_0 * U_0 * P_0 . \qquad (5)$$

Decomposition is carried out in a strictly defined order using substitutions:

$$\Delta S_i = \begin{array}{ll} Q_i * U_i * (P_i - P_0) & \text{Effect of price change.} \\ + & \\ Q_i * P_0 * (U_i * U_0) & \text{Effect of the change in the shareholding} \\ + & \\ U_0 * P_0 * (Q_i - Q_0) & \text{Effect of change in demand} \end{array} \qquad (6)$$

Companies with the highest positive meanings of ΔS_i (sum of effect of a given company in the analysed period) may be added to the investor's portfolio. The end result is necessary because the increase of one effect may happen at the expense of the decrease of the other and vice versa.

3. Method of company competitiveness assessment

First stage of the study. Assuming that the investor considers investing in shares of companies listed on the Warsaw Stock Exchange, and is interested in the banking sector for the transaction, the main companies in such a case would be those listed in Table 1. The companies in Table 1 are presented according to their market value. The most expensive company is PKOBP; its market value is over PLN 45.625 million, and it has been listed since 2004. The oldest companies selected for the analysis are MBANK and MILLENNIUM (listed since 1992). Their market value is PLN 18,621.18 million and PLN 9,037.72 million, while the P/B ratio is 1.36 and 1.23, respectively.

The youngest companies are ALIOR and GETINNOBLE (listed since the end of 2012). Their market value is PLN 9,113.09 million and PLN 1,343.53 million, while their P/B ratio is 1.43 and 0.27, respectively. In accordance with the proposed theory, there is a strong undervaluation of GETINNOBLE's shares on the market. This suggests the investment attractiveness of such shares. BGZBNPP has to be removed from the investment portfolio because of the P/E ratio, which is higher than standard value (20) and amounts to 40.40.

Second stage of the study. In accordance with the results of the calculations presented in Figure 1, the market was at its lowest turning point at the end of 2016.

The total turnover of the companies on the stock exchange selected for the analysis amounted to PLN 36.75 million and 192.46 thousand shares, with the nearest upper turning point showing the turnover of about PLN 66.13 million and 341.24 thousand shares. The difference between the discussed lower and upper points on the market is PLN 44.87 million (or 49%) and 148.78 thousand shares (or 56%). The analysis shows that the last analysed period (1 October 2017) is also attractive in terms of investment activity oriented towards a longer perspective.

Table 1. Basic and extended data on operations of companies selected for the analysis*

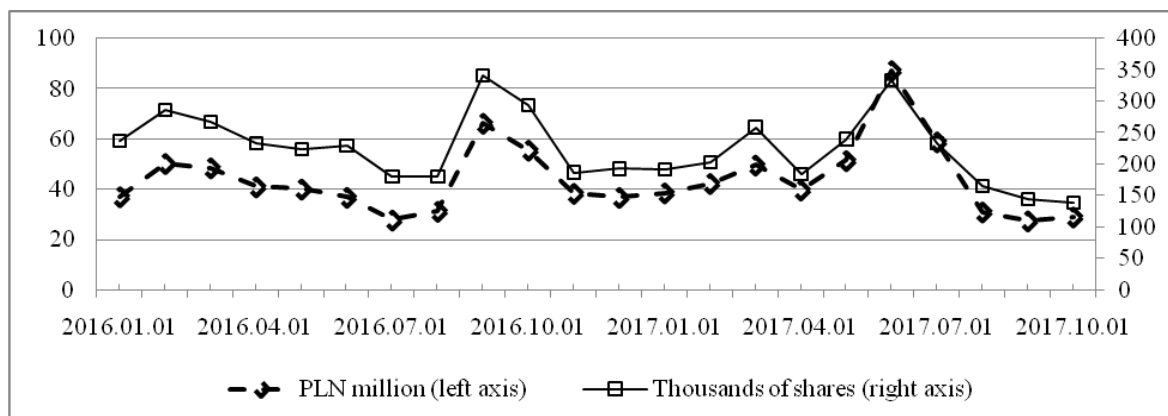| # | Basic data | | | | Extended data | | | | |
	Name	Abbreviation	Listed since	Number of issued shares	Market value, PLN million	Book value, PLN million	P/B ratio	P/E ratio	Dividend rate, %
1	2	3	4	5	6	7	8	9	10
1	PKOBP	PKO	Oct. 2004	1,250,000,000	45,625.00	34,352.00	1.33	16.60	0.00
2	BZWBK	BZW	June 2001	99,333,481	35,909.05	20,615.11	1.74	18.00	1.50
3	PEKAO	PEO	June 1998	262,470,034	33,307.45	21,693.80	1.54	17.50	6.80
4	INGBSK	ING	Jan. 1994	130,100,000	24,842.60	11,154.10	2.23	19.90	0.00
5	MBANK	MBK	Oct. 1992	42,311,255	18,621.18	13,654.95	1.36	18.40	0.00
6	ALIOR	ALR	Dec. 2012	129,263,624	9,113.09	6,388.14	1.43	14.30	0.00
7	HANDLOWY	BHW	June 1997	130,659,600	9,065.16	6,482.83	1.40	19.00	6.50
8	MILLENNIUM	MIL	Aug. 1992	1,213,116,777	9,037.72	7,339.77	1.23	15.50	0.00
9	BGZBNPP	BGZ	May 2011	84,238,318	5,370.19	6,381.02	0.84	40.40	0.00
10	GETINNOBLE	GNB	Jan. 2012	901,696,125	1,343.53	5,029.19	0.27	0.00	0.00

*Data current as at 19 October 2017
Source: own study based on official data of the Warsaw Stock Exchange [Retrieved from https://www.gpw.pl]

Source: own study based on official data of the Warsaw Stock Exchange [Retrieved from https://www.gpw.pl] and data available through the MT4 trading platform of the Polish Brokerage House TMS [Retrieved from https://www.tms.pl]

Fig. 1. Turnover of shares of companies on the Warsaw Stock Exchange selected for the analysis

At this stage of the analysis, the study periods were established, namely: T0 – starting point (1 January 2016); T1 – first study period (1 January – 1 December 2016); T2 – second study period (1 January 2016 – 1 October 2017).

Third stage of the study. The calculations of market shares of respective companies selected for the analysis are presented in Table 2.

Table 2. The share of companies in the turnover on the stock exchange in accordance with the proposed method of company competitiveness assessment*

| Index | Name of the bank | Study period | | | Accrual (Δu) | |
		T0	T1	T2	T1 - T0	T2 - T0
	PKOBP	2.34	1.80	2.26	-0.54	-0.09
	BZWBK	33.50	38.07	28.08	4.57	-5.42
	PEKAO	15.98	9.37	4.73	-6.61	-11.25
	INGBSK	3.48	2.77	7.17	-0.72	3.69
Share (Ui), %	MBANK	36.19	41.76	48.49	5.57	12.30
	ALIOR	4.25	2.96	7.20	-1.29	2.95
	HANDLOWY	4.17	2.77	1.96	-1.40	-2.21
	MILLENNIUM	0.09	0.04	0.11	-0.05	0.02
	GETINNOBLE	0.0008	0.0019	0.0063	0.00	0.01

Source: own study based on official data of the Warsaw Stock Exchange [Retrieved from https://www.gpw.pl] and data available through the MT4 trading platform of the Polish Brokerage House TMS [Retrieved from https://www.tms.pl]

According to the results, the largest market share is held by MBANK – 48.49% of transactions in the T2 period, which at 12.30 p.p. is more than at the starting point. PEKAO (share decreased by 11.25 p.p.) and BZWBK (share decreased by 5.42 p.p.) lost the most shares in the analysed period. INGBSK and ALIOR gained increasing investor confidence. HANDLOWY occupies the third place, which corresponds to the change of market share by 2.21 p.p. Therefore, from the point of view of a potential investor in the T1 period, it is worth noting MBANK and BZWBK companies. Investing in PEKAO would suggest significant losses.

The company with the highest price per share, according to calculations, is MBANK with price per one share of PLN 437.13 (Tables 2 and 3). For the analysed period T2 (1 January 2016–1 October 2017), the share price of this company increased by PLN 137.69. At this stage of the analysis, the increase of Δ(T1-T0) should be noted. From the investor's point of view, the following companies are worth noting: BZWBK, INGBSK and MBANK.

Table 4 presents the results of calculation of the turnover of companies on the stock exchange in accordance with the proposed method of company competitiveness assessment. According to the data, in the T1 period in relation to the starting point T0 the highest turnover was lost by PEKAO (78.18% of turnover). The turnover of HANDLOWY and BZWBK decreased by 63.95% and 10.24%, respectively.

Table 3. The price of one share of companies on the stock exchange in accordance with the proposed method of company competitiveness assessment

Index	Name of the bank	Study period			Accrual (Δp)		
		T0	T1	T2	T1 - T0	T2 - T0	T2 to T0, %
	PKOBP	24.97	26.80	36.27	1.83	11.30	45.27
	BZWBK	259.16	304.99	354.29	45.83	95.13	36.70
	PEKAO	135.56	121.59	127.60	-13.97	-7.96	-5.87
Price per	INGBSK	111.36	155.25	195.68	43.90	84.32	75.72
share (P),	MBANK	299.44	331.93	437.13	32.49	137.69	45.98
PLN	ALIOR	61.50	49.31	69.99	-12.19	8.50	13.81
	HANDLOWY	71.17	71.95	69.77	0.77	-1.41	-1.98
	MILLENNIUM	5.21	5.26	7.30	0.05	2.09	40.09
	GETINNOBLE	0.5275	1.2425	1.4825	0.72	0.96	181.04

Source: own study based on official data of the Warsaw Stock Exchange [Retrieved from https://www.gpw.pl] and data available through the MT4 trading platform of the Polish Brokerage House TMS [Retrieved from https://www.tms.pl]

Table 4. The turnover of companies on the stock exchange in accordance with the proposed method of company competitiveness assessment

Index	Name of the bank	Study period			Accrual (Δp)		
		T0	T1	T2	T1 - T0	T2 - T0	T2 to T0, %
	PKOBP	21.65	17.76	23.72	-3.88	2.07	9.56
	BZWBK	3,213.45	4,267.17	2,884.32	1,053.72	-329.14	-10.24
	PEKAO	801.64	418.64	174.95	-383.00	-626.69	-78.18
	INGBSK	143.60	157.89	406.86	14.28	263.25	183.32
Turnover (Si)	MBANK	4,011.16	5,093.90	6,145.46	1,082.75	2,134.30	53.21
	ALIOR	96.74	53.58	146.18	-43.16	49.44	51.10
	HANDLOWY	109.89	73.17	39.61	-36.72	-70.28	-63.95
	MILLENNIUM	0.17	0.08	0.24	-0.09	0.07	37.31
	GETINNOBLE	0.0002	0.0009	0.0027	0.00	0.00	1,673.92

Source: own study based on official data of the Warsaw Stock Exchange [Retrieved from https://www.gpw.pl] and data available through the MT4 trading platform of the Polish Brokerage House TMS [Retrieved from https://www.tms.pl]

The analysis of turnover of the companies selected for the analysis confirms the results of the previous stages and indicates the advisability of investing capital in the shares of BZWBK and MBANK in the period T1. However, the final decision regarding the investment portfolio can be made after the calculation of individual effects of changes in demand, prices per share and market shares of the company for companies. The results of these calculations are presented in Table 5.

Table 5. Respective effects of changes in competitiveness of companies on the market

Name of the bank	Demand effect		Share effect		Price effect	
	T1	T2	T1	T2	T1	T2
PKOBP	-154.88	-4691.10	-4944.78	-63067.73	1214.66	739124.84
BZWBK	-22989.14	-696312.44	435557.94	-40725284.68	641151.39	77442903.05
PEKAO	-5734.95	-173704.47	-329155.06	-44207301.54	-48108.92	-1091365.35
INGBSK	-1027.35	-31117.01	-29330.74	11904740.49	44640.25	17532173.18
MBANK	-28695.94	-869164.30	612873.47	106774473.31	498571.12	193572298.70
ALIOR	-692.10	-20962.73	-29218.72	5265854.99	-13249.97	1774186.02
HANDLOWY	-786.17	-23812.03	-36724.47	-4566648.43	788.16	-79920.29
MILLENNIUM	-1.25	-37.88	-93.47	3442.03	0.77	6869.49
GETINNOBLE	-0.001	-0.033	0.21	84.46	0.49	174.57

Source: own study based on official data of the Warsaw Stock Exchange [Retrieved from https://www.gpw.pl] and data available through the MT4 trading platform of the Polish Brokerage House TMS [Retrieved from https://www.tms.pl]

According to the results of the study, almost all companies lost from the change in market capacity in the analysed periods T1 and T2. This indicates a decrease in the number of investors and capital on the Polish securities market in the banking sector.

Almost all companies incurred losses on the share effect in the specified T1 study period. Only MBANK, BZWBK and GETINNOBLE were able to achieve a positive value of the share effect in the T1 period. According to calculations, the negative price effect in the T1 period can be observed in the case of two companies – PEKAO and ALIOR. It shows that, assuming that market shares can be maintained and that market capacity remains unchanged, these companies would lose the confidence of investors in any case and there is currently insufficient interest in them.

Let's try to determine the total competitiveness effect of companies on the market. Calculations show that only four companies in the T1 period can be satisfied, namely MBANK, BZWBK, INGBSK and GETINNOBLE. Despite the fact that the overall turnover on the stock exchange decreased, they managed to achieve a positive total effect of the change in turnover, thanks to maintaining the interest of investors in the operations of companies and increasing their shares, which resulted in an increase in the prices of their shares.

If the conducted study on historical data of changes of share price of companies selected for investment in the T1 period indicates that the effectiveness of the investment portfolio meets the investor's requirements, then in the period T2 companies MBANK, BZWBK, INGBSK, ALIOR, PKOBP, MILLENIUM, GETINNOBLE will be worthy of interest in terms of investment.

Due to the P/B ratio, adding BZWBK (1.74) and INGBSK (2.23) to the portfolio of shares may increase the risk for the investor, but it may also increase the profitability of the portfolio (the price may continue to rise as the profitability of operating activities of these companies increases). The companies with the highest risk in the T2 period, according to the results of the analysis, are HANDLOWY and PEKAO (in the T2 period, the negative meaning of the total effect is greater than in the T1 period).

4. Summary

Based on the obtained research results, as of 1 October 2017, the shares of such companies as the following have been attractive for purchase in order to invest on the stock exchange: MBANK, BZWBK, INGBSK, ALIOR, PKOBP, MILLENIUM, GETINNOBLE.

The method of analysis of companies' competitiveness presented in the study may become an effective tool for long-term investment on the securities market. This method is based on three basic indicators: total turnover on the stock exchange of selected companies, the company's market share and the price per share. Practical application of the described method may increase the attractiveness of investing in securities markets.

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