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LIQUIDITY – PROFITABILITY TRADE-OFF ON THE EXAMPLE OF COMPANIES LISTED ON MAIN AND ALTERNATIVE NEW CONNECT MARKETS ON WARSAW STOCK EXCHANGE

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Abstract

The goal of this paper is related to the liquidity and profitability relationship analysis and their maxima assessment in the companies listed in the main and alternative markets of Warsaw Stock Exchange. The trade-off between maximum profitability and liquidity is the result of value maximization and bankruptcy prevention strategies and this approach is expected to be similar in all listed companies due to investors' expectation. It has been found that there is no difference in management goals in the markets taken into consideration and companies in both research samples maximize profitability within a conservative approach to the liquidity. The maximum liquidity, on the other hand, is determined with a similar level of profitability as measured by ROE on the main market of WSE and NewConnect.

Keywords: liquidity, profitability, trade-off.

JEL Class: G3, M2.

INTRODUCTION

The problem of a liquidity–profitability relationship and their trade-off is analyzed in this paper based on the example of two groups of companies listed on the Warsaw Stock Exchange as well as the main and alternative NewConnect markets. In the main market the mature and larger companies are traded while the alternative market is dedicated to the companies in earlier stages of development, and they are significantly smaller. It is assumed that the size is related to the age of company although this relationship does not have to be linear and the maturity is assessed by the market that a company is traded on. The motivation for the presented research is related to some current findings that reflect issues of liquidity and profitability measurement and their maxima, size of companies and types of function describing this phenomena.

According to Louw et al. [2019] different working capital measures are related significantly to different profitability ratios. Dash and Hauman [2009] proposed a goal programming model for optimizing the working capital management. Dalci et al. [2019] investigated whether a firm size influences the relationship between the cash conversion cycle and profitability. Mahmood et al. [2019] evaluated the moderating effects of a firm size and leverage on working capital–profitability relationship, presenting how the break-even point shifts when a company expands. Finally, Adamczyk and Waśniewski [2018] assumed that the liquidity–profitability relation is nonlinear.

The aim of this paper is related to the liquidity–profitability function analysis and the problem presentation in the light of extrema that can help to manage the finances of companies. In the presented paper liquidity is considered in a dynamic and static form, respectively reflected by the cash conversion cycle and current and quick ratios while the profitability is reflected by return on equity and net profit margin. The nonlinear approach is applied for liquidity influencing the profitability and vice versa. Maximum profitability is required in the process of value maximization while maximum liquidity – in the process of regulating obligations and bankruptcy prevention. In young companies, moreover, maximum liquidity can be related to the preparation to the take-off stage, characterized by the fast growth that requires inventories, long terms of payments and cash. The following thesis is verified in this paper: liquidity and profitability have their maxima in relation to each other and they are similar in both sample groups due to investors' expectations.

The paper is composed of several sections: introduction, literature overview, data and methods, results and conclusions.

1. LITERATURE OVERVIEW

The liquidity–profitability relationship is analyzed in the literature taking into account different markets and variety of ratios. Profitability and liquidity directly influence the value of company, whose maximization is a trade-off between maximum earnings and minimum cost of capital related to risk. The trade-off between profitability and liquidity maximization determines the decisions in a company and is the result of their relationship.

The fundamental findings on the liquidity–profitability relationship started the discussion about the ratios that should be taken into consideration and the strategies that make the business successful. Jose et al. [1996] examined the relationship between profitability ratios and liquidity measured by the cash conversion cycle and they found a strong evidence that aggressive working capital policies enhance profitability. Knauer and Wöhrmann [2013] stated that managing current assets and liabilities is highly relevant to the success of the firm. A number of analyses provide evidence of positive effects of accounts receivable and inventory management on profitability. However, the results for the effects of accounts payable management on profitability are driven by reverse causality. Cash conversion cycle was suggested to be the best measure of liquidity e.g. by Richards and Laughlin [1980].

Nazir and Afza [2009] investigated the relationship between working capital management policies and profitability by analyzing the impact of aggressive working capital investment and financing policies on return on assets and Tobin's Q. They concluded that managers can create value if they adopt a conservative approach towards working capital investment and working capital financing policies. The study also proved that investors prefer the stocks of the firms that adopt an aggressive approach to managing their short-term liabilities.

Desai and Joshi [2011] stated that working capital management is an important part in firm's financial management decisions and an optimal working capital should positively influence the creation of a firm value. To reach an optimal working capital level, managers should control the trade-off between profitability and liquidity accurately. Shortening a cash conversion cycle, to a certain level, influences the growth of a company value that is limited by the optimal liquidity. Cash conversion cycle, on the other hand, should be shortened by an aggressive approach to the short-term liabilities rather than conservative receivables and inventories policies. These statements can support value creation in companies listed in the capital markets.

Trade-off reflecting the optimal level of liquidity is a subject of another group of research studies in the field of liquidity–profitability relationship. Eljelly [1991] presented the results of the analysis of the relationship between liquidity and profitability in the context of the optimum of this relation with liquidity being

measured as a current ratio and the cash conversion cycle. The results showed that there was a negative relationship between liquidity and profitability. On the other hand, Dash and Hauman [2009] proposed a goal programming model for optimizing the working capital management.

The research on the liquidity–profitability is conducted on different markets since the behavior of managers may vary due to the cultural differences. Deloof [2003] was looking for the relation between working capital management and corporate profitability for a sample of large Belgian non-financial firms. The results suggest that managers can increase corporate profitability by reducing a number of days accounts receivable and inventories, therefore decreasing the cash conversion cycle. Lazaridis et al. [2006], on the other hand, investigated the relationship of corporate profitability and working capital management and found statistical significance between profitability measured through gross operating profit, and the cash conversion cycle.

Nobaneee and AlHajjar [2009] investigated the relationship between working capital management and firm profitability on a sample of Japanese non-financial firms listed on the stock exchange. The results suggest that managers can increase profitability of their firms by shortening the cash conversion cycle, the receivables collection period and the inventory conversion period or lengthening the payable deferral period. However, managers should be careful while lengthening the payable deferral period because this could damage the credit reputation and harm profitability in the long run.

The research on the problem of liquidity–profitability was analyzed in groups of companies that represent small firms, too. García-Teruel and Martínez-Solano [2007] provided an empirical evidence on the effects of working capital management on the profitability of a sample of small and medium-sized Spanish firms and found that managers can create value by reducing their inventories and the number of accounts days outstanding. Moreover, shortening the cash conversion cycle also improves the firm's profitability.

Hussain [2012] stated that adequate working capital is essential as it directly affects the profitability and liquidity position of the firm. In order to achieve an optimal level of working capital the managers should accurately control the liquidity–profitability trade-off. The result indicated that low investment in current assets and low current liability financing increases the profitability of firms. The study also suggested that a company size, sale growth and leverage ratio significantly affect the profitability of the firm. The results revealed that profitability of the firm is significantly affected by the working capital management and working management policies.

Dalci et al. [2019] investigated whether a firm size moderates the relationship between the cash conversion cycle and profitability for German non-financial firms. The results show that the relationship between the cash conversion cycle

and profitability is moderated by a firm size. As the firm size gets smaller and the cash conversion cycle gets longer, the returns on assets decrease. In this context, reducing the length of the cash conversion cycle has a positive impact on profitability for small and medium-sized firms. The size of companies is related to their growth that should be, therefore, linked to the liquidity–profitability relationship. Nastiti et al. [2019] examined the determinants of working capital management and tested different effects of the determinants based on an enterprise size and age. The findings reveal that sales and economic growth determine working capital management. However, the effects of the determinants of working capital management differ depending on an enterprise size and age. To be more specific, economic growth is the only determinant that exhibits different effects on working capital management between different enterprise size and age subsamples. Besides the economic growth, capital expenditure and operating cash flow are the other enterprise-specific determinants that exhibit different effects on working capital management between the two enterprise age subsamples. The empirical results suggest that manufacturing enterprises must focus more on their sales growth because it affects their ability to manage working capital efficiently. Besides, younger manufacturing enterprises need to shorten their cash cycles that are longer compared to old enterprises.

There are numerous techniques used to find the liquidity–profitability relationship and the trade-off between these phenomena starting from a simple cross section analysis through more advanced panel data regressions. Louw et al. [2019] examined and contrasted the long-run relationship between the working capital management and profitability of South African firms. Techniques used in the study included the cointegration and Granger causality tests. The study revealed the long-run relationship between working capital management and the profitability in most of these cases. Further to this, the presence of both unidirectional and bidirectional causality between working capital management and profitability was found. In addition, the results indicated that working capital management had a greater impact on the profitability of retail firms than of construction firms.

Prasad et al. [2019] investigated the impact of deviation from the target investment in working capital measured by a net trade cycle on the profitability measured by gross and net operating income. The authors used a fixed effect regression as the benchmark for finding the determinants of a net trade cycle. Furthermore, this study explored the impact of deviation from the target investments in working capital on the profitability. The results revealed that profitability was influenced by the deviation from the target net trade cycle.

Mahmood et al. [2019] evaluated the moderating effects of a firm size and leverage on the working capital–profitability relationship among Chinese companies. While applying the generalized method of moments technique on

panel data it was found that a firm size and leverage influenced the working capital–profitability relationship. Small or low-leverage firms have an inverted U-shaped working capital–profitability relationship but this relationship is U-shaped for large or high-leverage firms. This study shows how the break-even point of the working capital–profitability relationship shifts when a company develops.

Vuković and Jakšić [2019] presented a universal approach to the working capital–profitability issue. The research was designed to examine the effect of working capital management on company profitability in the food industry in Southeast Europe. They analyzed the influence of certain variables of working capital management on the probability of higher profitability by applying probit regression. The results showed that most of the analyzed variables of working capital management have a statistically significant impact on the probability of higher profitability.

Adamczyk and Waśniewski [2018] stated that a high liquidity level also causes a decrease in the profitability of the enterprise. They confirmed that excessive liquidity had a negative impact on the profitability, however, the level of liquidity ratios at which this phenomenon occurs, significantly exceeded the values generally considered to be normative, moreover, this study confirmed that liquidity–profitability relationship is nonlinear.

2. DATA AND METHODS

The data for the research derives from Notoria Database for the years 2002–2017. The surveys for companies listed on two markets: WSE main and NewConnect alternative markets are analyzed separately. The following sets of yearly variables are used in the study:

- NPM – net profit margin,
- ROE – the return on equity,
- CR – current liquidity ratio,
- QR – quick ratio,
- CCC – cash conversion cycle.

Models with non-linear impact of liquidity on profitability and profitability on liquidity are applied with OLS estimation of panel data. The non-linear relationship is tested using the square function. The general form of the model is presented by an equation:

$$X_{i,t} = \alpha_1 + \beta_1 Y_{i,t} + \beta_2 Y_{i,t}^2 + \varepsilon_{i,t} \qquad (1)$$

where X and Y are variables, α is constant, β is a model coefficient and ε is a random component. Certain β values allow to determine the maximum function.

$$\beta_1 > 0, \beta_2 < 0 \qquad (2)$$

For β levels (2) it is possible to indicate the maximum values of the quadratic functions. The function given by the formula (1) is used for the analysis of curvilinear dependencies.

In the results presented in the next section, the models will be tested regarding the liquidity–profitability relationships based on the WSE and NewConnect markets.

3. RESULTS

Models with non-linear impact of liquidity on profitability and profitability on liquidity are tested in this section. Profitability and liquidity are analyzed as descriptive and described phenomena (X,Y) because they can influence each other simultaneously in the management process. Maximum profitability is required in the process of value maximization while maximum liquidity can be required in the process regulating obligations and therefore, the bankruptcy prevention. Moreover, its maximum value is necessary in the fast growth stage of development. The research is done in two groups of companies listed on the Warsaw Stock Exchange – mature entities traded in the main market and firms in earlier stages of development traded on Ne Connect.

4. WSE MAIN MARKET LISTED COMPANIES

The WSE main market listed companies analysis is provided in the following section of this paper regarding the non-linear models and their extrema. Models 1, 2 and 3 (given by the formulas 3, 4 and 5 respectively) with the liquidity influencing profitability measured by ROE are tested and the results are presented in Table 1.

Model 1 $$\mathrm{ROE}_{i,t} = \alpha_1 + \beta_1 \mathrm{CR}_{i,t} + \beta_2 \mathrm{CR}_{i,t}^2 + \varepsilon_{i,t} \qquad (3)$$

Model 2 $$\mathrm{ROE}_{i,t} = \alpha_1 + \beta_1 \mathrm{QR}_{i,t} + \beta_2 \mathrm{QR}_{i,t}^2 + \varepsilon_{i,t} \qquad (4)$$

Model 3 $$\mathrm{ROE}_{i,t} = \alpha_1 + \beta_1 \mathrm{CCC}_{i,t} + \beta_2 \mathrm{CCC}_{i,t}^2 + \varepsilon_{i,t} \qquad (5)$$

The parameters of models are presented in Table 1.

Table 1. Models with non-linear impact of liquidity on profitability (ROE) – WSE main market

Category	Model 1 (t-Student)	Model 2 (t-Student)	Model 3 (t-Student)
Const	–0.00924501 (–0.8167)	0.0628600 (11.26)***	0.0770953 (16.50)***
CR	0.0554427 (6.907)***		
CR^2	–0.00576719 (–5.788)***		
QR		0.00743249 (0.9982)	
QR^2		−0.000887061 (−0.8438)	
CCC			0.0000473933 (1.224)
CCC^2			−0.000000274445 (−3.286)***
Adj. R^2	0.014803	0.000285	0.004058
F (p value)	26.73042 (0.0000)	0.519836 (0.594662)	5.785896 (0.003107)
Akaike criterion	367.1792	504.0717	−76.35745
Durbin-Watson Stat.	0.832233	0.815877	0.798044
Extremum	4.8	no	no

It is assumed that the parameter is statistically significant for every p-value smaller than 0.1, for increasing confidence intervals of 1% (***), 5% (**) and 10% (*) respectively. The models are characterized by low R square values because their purpose is not to explain the phenomena. The p-value for the F statistic below 0.05 means that the model consists of variables that have a statistically significant impact on the explained variable. The Akaike criterion allows to compare models with each other. The Durbin-Watson statistics indicate autocorrelation of model residuals, and its value is characteristic for models based on financial data.

Source: own calculations.

Based on the results presented in Table 1 it can be concluded that in Model 1 the non-linear effect of current ratio on ROE is found with the level of 4.8. In the case of Models 2 and 3 no non-linear relationship between liquidity and profitability is found and the maxima of the functions are not determined.

Table 2 contains results for non-linear models representing the impact of liquidity on net profit margin given by Models 4, 5 and 6 (formulas 6, 7 and 8 respectively).

$$\text{Model 4} \qquad \mathrm{NPM}_{i,t} = \alpha_1 + \beta_1 \mathrm{CR}_{i,t} + \beta_2 \mathrm{CR}_{i,t}^2 + \varepsilon_{i,t} \qquad (6)$$

$$\text{Model 5} \qquad \mathrm{NPM}_{i,t} = \alpha_1 + \beta_1 \mathrm{QR}_{i,t} + \beta_2 \mathrm{QR}_{i,t}^2 + \varepsilon_{i,t} \qquad (7)$$

$$\text{Model 6} \qquad \mathrm{NPM}_{i,t} = \alpha_1 + \beta_1 \mathrm{CCC}_{i,t} + \beta_2 \mathrm{CCC}_{i,t}^2 + \varepsilon_{i,t} \qquad (8)$$

The results of models estimation are presented in Table 2.

Table 2. Models with a non-linear effect of liquidity on the net profit margin – WSE main market

Category	Model 4 (t-Student)	Model 5 (t-Student)	Model 6 (t-Student)
Const	−0.0675641 (−5.417)***	0.0167377 (2.697)***	0.0371407 (9.150)***
CR	0.0712258 (7.925)***		
CR^2	−0.00531375 (−4.681)***		
QR		0.0524345 (5.975)***	
QR^2		−0.00336992 (−2.636)***	
CCC			0.000198477 (5.913)***
CCC^2			–0.000000787958 (-1.054)***
Adj. R7.^2	0.038526	0.024540	0.012426
F (p value)	69.50163 (0.0000)	44.39046 (0.0000)	18.16242 (0.0000)
Akaike criterion	975.77	1194.49	–844.95
Durbin-Watson Stat.	1.037085	1.041332	0.973024
Extremum	6.7	7.78	125.94

It is assumed that the parameter is statistically significant for every p-value smaller than 0.1, for increasing confidence intervals of 1% (***), 5% (**) and 10% (*) respectively. The models are characterized by low R square values because their purpose is not to explain the phenomena. The p-value for the F statistic below 0.05 means that the model consists of variables that have a statistically significant impact on the explained variable. The Akaike criterion allows to compare models with each other. The Durbin-Watson statistics indicate autocorrelation of model residuals, and its value is characteristic for models based on financial data.

Source: own calculations.

Table 2 contains the results of estimation the parameters of the models with non-linear function of liquidity affecting net profit margin and it can be concluded that they are significant in all three cases. The maximum of net profit margin level is when current ratio is 6.7, quick ratio 7.78 and cash conversion cycle 125.94 days.

Since profitability can influence liquidity in the bankruptcy prevention process, Table 3 presents the results of non-linear functions estimation with ROE influencing the liquidity given by the Models 7, 8 and 9 (formulas 9, 10 and 11 respectively).

Model 7 $$CR_{i,t} = \alpha_1 + \beta_1 ROE_{i,t} + \beta_2 ROE_{i,t}^2 + \varepsilon_{i,t} \quad (9)$$

Model 8 $$QR_{i,t} = \alpha_1 + \beta_1 ROE_{i,t} + \beta_2 ROE_{i,t}^2 + \varepsilon_{i,t} \quad (10)$$

Model 9 $$CCC_{i,t} = \alpha_1 + \beta_1 ROE_{i,t} + \beta_2 ROE_{i,t}^2 + \varepsilon_{i,t} \quad (11)$$

The results of models estimation are presented in Table 3.

Table 3. Models with non-linear impact of profitability on liquidity – WSE main market

Category	Model 7 CR (t-Student)	Model 8 QR (t-Student)	Model 9 CCC (t-Student)
Const.	2.14105 (69.16)***	0.844000 (30.51)***	21.9832 (9.036)***
ROE	0.380916 (3.287)***	0.0391770 (0.3832)	2.30645 (0.2414)
ROE^2	−0.319823 (−2.651)***	−0.0521552 (−0.4958)	−20.2160 (−2.006)**
Adj. R^2	0.007489	0.000157	0.001686
F (p value)	13.42323 (0.0000)	0.286758 (0.750710)	2.397791 (0.091103)
Akaike criterion	13754.01	13370.88	35110.56
Durbin-Watson Stat.	0.669225	0.764911	0.643530
Extremum	0.59	no	no

It is assumed that the parameter is statistically significant for every p-value smaller than 0.1, for increasing confidence intervals of 1% (***), 5% (**) and 10% (*) respectively. The models are characterized by low R square values because their purpose is not to explain the phenomena. The p-value for the F statistic below 0.05 means that the model consists of variables that have a statistically significant impact on the explained variable. The Akaike criterion allows to compare models with each other. The Durbin-Watson statistics indicate autocorrelation of model residuals, and its value is characteristic for models based on financial data.

Source: own calculations.

As it is presented in Table 3, a significant statistical impact of ROE on current ratio was found with the maximum value 0.59, in the other models no extremum was found.

Table 4 contains the results of non-linear models estimation regarding the impact of net profit margins on liquidity for the WSE main market given by Models 10, 11 and 12 (formulas 12, 13 and 14 respectively).

Model 10 $$CR_{i,t} = \alpha_1 + \beta_1 NPM_{i,t} + \beta_2 NPM_{i,t}^2 + \varepsilon_{i,t} \quad (12)$$

Model 11 $$QR_{i,t} = \alpha_1 + \beta_1 NPM_{i,t} + \beta_2 NPM_{i,t}^2 + \varepsilon_{i,t} \quad (13)$$

Model 12 $$CCC_{i,t} = \alpha_1 + \beta_1 NPM_{i,t} + \beta_2 NPM_{i,t}^2 + \varepsilon_{i,t} \quad (14)$$

The results of models estimation are presented in Table 4.

Table 4. Models with non-linear impact of net profit margin on liquidity – WSE main market

Category	Model 10 CR (t-Student)	Model 11 QR (t-Student)	Model 12 CCC (t-Student)
Const.	1.99927 (70.83)***	0.657474 (27.52)***	13.7923 (6.181)***
NPM	1.10886 (11.57)***	0.783397 (9.920)***	60.7831 (5.926)***
NPM^2	0.523678 (6.600)***	0.762486 (11.72)***	2.52388 (0.2653)
Adj. R^2	0.044451	0.059261	0.012070
F (p value)	80.68721 (0.0000)	111.1534 (0.0000)	17.63614 (0.0000)
Akaike criterion	13082.20	12187.26	35638.72
Durbin-Watson Stat.	0.671896	0.815457	0.608264
Extremum	no	no	no

It is assumed that the parameter is statistically significant for every p-value smaller than 0.1, for increasing confidence intervals of 1% (***), 5% (**) and 10% (*) respectively. The models are characterized by low R square values because their purpose is not to explain the phenomena. The p-value for the F statistic below 0.05 means that the model consists of variables that have a statistically significant impact on the explained variable. The Akaike criterion allows to compare models with each other. The Durbin-Watson statistics indicate autocorrelation of model residuals, and its value is characteristic for models based on financial data.

Source: own calculations.

As it is presented in Table 4, Models 10 and 11 show a non-linear influence of net profit margin on liquidity, but without an extreme value. For Model 12 no non-linear relationship was found.

5. NEWCONNECT ALTERNATIVE MARKET LISTED COMPANIES

Models 13, 14 and 15 (formulas 15, 16 and 17 respectively) representing the influence of liquidity on profitability measured by ROE on the New Connect alternative market are tested and the results are presented in Table 5.

$$\text{Model 13} \qquad \mathrm{ROE}_{i,t} = \alpha_1 + \beta_1 \mathrm{CR}_{i,t} + \beta_2 \mathrm{CR}_{i,t}^2 + \varepsilon_{i,t} \qquad (15)$$

$$\text{Model 14} \qquad \mathrm{ROE}_{i,t} = \alpha_1 + \beta_1 \mathrm{QR}_{i,t} + \beta_2 \mathrm{QR}_{i,t}^2 + \varepsilon_{i,t} \qquad (16)$$

$$\text{Model 15} \qquad \mathrm{ROE}_{i,t} = \alpha_1 + \beta_1 \mathrm{CCC}_{i,t} + \beta_2 \mathrm{CCC}_{i,t}^2 + \varepsilon_{i,t} \qquad (17)$$

The results of models parameters estimation are presented in Table 5.

Table 5. Models with non-linear impact of liquidity on profitability (ROE) – NewConnect alternative market

Category	Model 13 (t-Student)	Model 14 (t-Student)	Model 15 (t-Student)
Const.	−0.183619 (−8.079)***	−0.0308814 (−2.519)***	0.0370466 (2.539)**
CR	0.123410 (8.364)***		
CR^2	−0.0122999 (−7.243)***		
QR		0.0560228 (4.196)***	
QR^2		−0.00683428 (−3.916)***	
CCC			−0.0000895577 (−0.8163)
CCC^2			−0.000000217719 (−1.679)*
Adj. R^2	0.036867	0.008336	0.009782
F (p value)	37.91405 (0.0000)	8.805705 (0.000155)	4.139155 (0.016263)
Akaike criterion	2107.434	2222.499	881.9031
Durbin-Watson Stat.	0.915441	0.889268	1.041390
Extremum	5.02	4.10	no

It is assumed that the parameter is statistically significant for every p-value smaller than 0.1, for increasing confidence intervals of 1% (***), 5% (**) and 10% (*) respectively. The models are characterized by low R square values because their purpose is not to explain the phenomena. The p-value for the F statistic below 0.05 means that the model consists of variables that have a statistically significant impact on the explained variable. The Akaike criterion allows to compare models with each other. The Durbin-Watson statistics indicate autocorrelation of model residuals, and its value is characteristic for models based on financial data.

Source: own calculations.

Models 13 and 14 estimation, as it is presented in Table 5, confirm the non-linear impact of current and quick ratios on ROE. The maximum value of function for current ratio is 5.02, while for quick ratio it is 4.1.

Table 6 contains results of estimation of models with a non-linear effect of liquidity on the net profit margin. Models 16, 17 and 18 (formulas 18, 19 and 20 respectively) present this relationship.

$$\text{Model 16} \qquad \mathrm{NPM}_{i,t} = \alpha_1 + \beta_1 \mathrm{CR}_{i,t} + \beta_2 \mathrm{CR}_{i,t}^2 + \varepsilon_{i,t} \tag{18}$$

$$\text{Model 17} \qquad \mathrm{NPM}_{i,t} = \alpha_1 + \beta_1 \mathrm{QR}_{i,t} + \beta_2 \mathrm{QR}_{i,t}^2 + \varepsilon_{i,t} \tag{19}$$

$$\text{Model 18} \qquad \mathrm{NPM}_{i,t} = \alpha_1 + \beta_1 \mathrm{CCC}_{i,t} + \beta_2 \mathrm{CCC}_{i,t}^2 + \varepsilon_{i,t} \tag{20}$$

The results of models parameters estimation are presented in Table 6.

Table 6. Models with a non-linear effect of liquidity on the net profit margin – NewConnect alternative market

Category	Model 16 (t-Student)	Model 17 (t-Student)	Model 18 (t-Student)
Const	−0.218954 (−9.852)***	−0.0787423 (−6.618)***	−0.0159687 (−1.520)
CR	0.123160 (8.302)***		
CR^2	−0.0123552 (−7.100)***		
QR		0.0624816 (4.514)***	
QR^2		−0.00633275 (−3.423)***	
CCC			−0.000190721 (−2.405)**
CCC^2			−0.00000009.58273 (−0.7509)
Adj. R^2	0.038599	0.012640	0.011328
F (p value)	37.88005 (0.0000)	12.74445 (0.0000)	4.938175 (0.007372)
Akaike criterion	1870.637	1977.301	364.7186
Durbin-Watson Stat.	0.998390	0.980778	0.862567
Extremum	5.5	4.93	no

It is assumed that the parameter is statistically significant for every p-value smaller than 0.1, for increasing confidence intervals of 1% (***), 5% (**) and 10% (*) respectively. The models are characterized by low R square values because their purpose is not to explain the phenomena. The p-value for the F statistic below 0.05 means that the model consists of variables that have a statistically significant impact on the explained variable. The Akaike criterion allows to compare models with each other. The Durbin-Watson statistics indicate autocorrelation of model residuals, and its value is characteristic for models based on financial data.

Source: own calculations.

As it is presented in Table 6 the maximum value of function for Model 16 is 0.5 for current ratio, while the maximum value for Model 17 is 4.93 for quick ratio.

The results of estimation models representing the impact of profitability on liquidity are presented in Table 7 regarding Models 19, 20 and 21 (formulas 21, 22 and 23 respectively).

Model 19 $$CR_{i,t} = \alpha_1 + \beta_1 ROE_{i,t} + \beta_2 ROE_{i,t}^2 + \varepsilon_{i,t} \quad (21)$$

Model 20 $$QR_{i,t} = \alpha_1 + \beta_1 ROE_{i,t} + \beta_2 ROE_{i,t}^2 + \varepsilon_{i,t} \quad (22)$$

Model 21 $$CCC_{i,t} = \alpha_1 + \beta_1 ROE_{i,t} + \beta_2 ROE_{i,t}^2 + \varepsilon_{i,t} \quad (23)$$

The results of models parameters estimation are presented in Table 7.

Table 7. Models with non-linear impact of profitability on liquidity – NewConnect alternative market

Category	Model 19 CR	Model 20 QR	Model 21 CCC
Const	2.58462 (51.18)***	1.28828 (27.60)***	49.9672 (8.054)***
ROE	0.368352 (2.864)***	0.00988544 (0.08323)	−48.4011 (−3.015)**
ROE^2	−0.282710 (−2.426)**	−0.277187 (−2.549)**	−28.5110 (−1.948)*
Adj. R^2	0.014291	0.004165	0.010931
F (p value)	14.36050 (0.0000)	4.381596 (0.012620)	4.630505 (0.010001)
Akaike criterion	8502.541	8784.247	10944.48
Durbin-Watson Stat.	0.998390	0.908871	0.741456
Extremum	0.65	no	no

It is assumed that the parameter is statistically significant for every p-value smaller than 0.1, for increasing confidence intervals of 1% (***), 5% (**) and 10% (*) respectively. The models are characterized by low R square values because their purpose is not to explain the phenomena. The p-value for the F statistic below 0.05 means that the model consists of variables that have a statistically significant impact on the explained variable. The Akaike criterion allows to compare models with each other. The Durbin-Watson statistics indicate autocorrelation of model residuals, and its value is characteristic for models based on financial data.

Source: own calculations.

Based on the results presented in Table 7 the non-linear impact of ROE on current ratio and cash conversion cycle can be confirmed. However, the maximum function can only be determined for model 19 with current ratio as an endogenic variable with the value of ROE 0.65.

Table 8 contains estimation of non-linear models related to the impact of net profit margin on liquidity and are presented in Models 22, 23 and 24 (formulas 24, 25 and 26 respectively).

Model 22 $$CR_{i,t} = \alpha_1 + \beta_1 NPM_{i,t} + \beta_2 NPM_{i,t}^2 + \varepsilon_{i,t} \quad (24)$$

Model 23 $$QR_{i,t} = \alpha_1 + \beta_1 NPM_{i,t} + \beta_2 NPM_{i,t}^2 + \varepsilon_{i,t} \quad (25)$$

Model 24 $$CCC_{i,t} = \alpha_1 + \beta_1 NPM_{i,t} + \beta_2 NPM_{i,t}^2 + \varepsilon_{i,t} \quad (26)$$

The results of models parameters estimation are presented in Table 8.

Table 8. Models with non-linear impact of net profit margin on liquidity – NewConnect alternative market

Category	Model 22 CR	Model 23 QR	Model 24 CCC
Const	2.41135 (50.16)***	1.06686 (25.11)***	30.5341 (6.121)***
NPM	0.731954 (5.615)***	0.561597 (4.812)***	−60.9831 (−2.527)**
NPM^2	0.262332 (2.606)***	0.291355 (3.207)***	−11.7844 (−0.6559)
Adj. R^2	0.016456	0.011934	0.011175
F (p value)	15.78601 (0.0000)	12.02394 (0.0000)	4.870668 (0.007881)
Akaike criterion	7967.968	8020.940	11031.51
Durbin-Watson Stat.	0.934969	0.944633	0.539787
Extremum	no	no	no

It is assumed that the parameter is statistically significant for every p-value smaller than 0.1, for increasing confidence intervals of 1% (***), 5% (**) and 10% (*) respectively. The models are characterized by low R square values because their purpose is not to explain the phenomena. The p-value for the F statistic below 0.05 means that the model consists of variables that have a statistically significant impact on the explained variable. The Akaike criterion allows to compare models with each other. The Durbin-Watson statistics indicate autocorrelation of model residuals, and its value is characteristic for models based on financial data.

Source: own calculations.

Table 8 contains the results of estimation of non-linear models for the impact of net profit margin on liquidity and it can be concluded that these models show a non-linear relationship, but without extrema.

The maximum values for ratios representing the liquidity and profitability in the two research groups containing companies traded on main and alternative markets of Warsaw Stock Exchange were analyzed. The pattern of results shows that the conservative approach to the liquidity results in the profitability maximization both for ROE and NPM similarly on both markets are taken into consideration. Profitability influences the liquidity in a lower degree in both subsamples and it is slightly lower for the companies traded on the main WSE market than on NewConnect if companies focus on maximum liquidity.

CONCLUSIONS

The problem of maximum levels of different ratios representing the working capital management strategies was analyzed in two groups of companies: larger and smaller ones traded respectively on the main and alternative markets of the Warsaw Stock Exchange. Moreover based on the assumption that the liquidity–profitability relationship is not-linear, in the presented research the square function was applied.

The value maximization and liquidity maintenance are the main goals of the company performance when the financial aspects are taken into consideration. Liquidity influences the profitability as well as profitability can influence liquidity in the process of management. In the case of liquidity affecting the profitability, the value creation is the main purpose of management and in case of profitability affecting the liquidity the ability to regulate obligations, operating risk reduction and finally bankruptcy prevention are the main issues. In young companies maximum level of liquidity can be related to the fast growth. For this reason models are tested both for liquidity affecting the profitability and profitability affecting the liquidity.

The results show the similar patterns of management in the two research groups. Maximum profitability measured by ROE for the main market is 4.8 and for NewConnect market 5.02. as measured by current ratio. The liquidity is slightly lower for mature companies than for smaller ones, but in each case the conservative approach generates the maximum profitability. In case of NewConnect the quick ratio also influences ROE. In case of net profit margin, the current ratio influences it in both markets and the liquidity as measured by current ratio is lower for alternative market in relation to the maximum level of NPM. In case of larger companies cash conversion cycle significantly determines for instance the maximum level of net profit margin.

When the opposite relationship is taken into consideration and profitability influences the liquidity, on both analyzed markets ROE is related to the maximum level of current ratio.

It can be concluded that companies traded on main and alternative markets of WSE are managed in a similar way, the conservative liquidity approach is related to the maximum values of profitability and ROE also determines the maximum level of current ratio in both markets.

It must be stated that the presented results should be taken into account with some caution. First of all, the authors are aware of the weakness of available data and proposed models. Although the data includes time series of 15 years, it seems that the period is too short for this type of study. This limitation, however, is insurmountable and is mainly due to the length of functioning of the NewConnect alternative market. It is worth adding that there were often gaps in the observations

caused by the company's withdrawal from the stock exchange or suspension of its listing. Unfortunately, this is quite a characteristic feature of the young NewConnect market. The models themselves are characterized by a very low R square, but the F statistics in the analyzed cases are significant, and the determination of maxima and minima alone does not require particularly well--chosen models. The authors believe that further research can help to confirm their conclusions by comparing other markets.

BIBLIOGRAPHY

Adamczyk A., Waśniewski P., 2018, *Czy istnieje nadpłynność? Analiza związku między płynnością a rentownością*, „Finanse, Rynki Finansowe, Ubezpieczenia", nr 92.

Dalci I., Tanova C., Ozyapici H., Bein M.A., 2019, *The Moderating Impact of Firm Size on the Relationship between Working Capital Management and Profitability*, „Prague Economic Papers", vol. 3.

Dash M., Hanuman R., 2009, *A Liquidity-Profitability Trade-Off Model for Working Capital Management*, „SSRN Working Paper Series", no. 10, http://ssrn.com/abstract=1408722 [access 30.09.2020].

Deloof M., 2003, *Does Working Capital Management Affect Profitability of Belgian Firms?*, „Journal of Business Finance & Accounting", vol. 30, issue 3–4, https://doi.org/10.1111/1468-5957.00008.

Desai J., Joshi N., 2011, *Effect of Working Capital Management on Profitability of Firms in India*, „SSRN Working Paper Series", http://ssrn.com/abstract=1774686 [access 30.09.2020].

Eljelly A., 1991, *Liquidity-profitability tradeoff: An empirical investigation in an emerging market*, „International Journal of Commerce and Management", vol. 14(2), https://doi.org/10.1108/10569210480000179.

García-Teruel P.J., Martínez-Solano P., 2007, *Effects of working capital management on SME profitability*, „International Journal of Managerial Finance", vol. 3, issue 2.

Hussain A., 2012, *Aggressiveness and conservativeness of working capital: A case of Pakistani manufacturing sector*, „European Journal Of Scientific Research", vol. 73, issue 2.

Jose M.L., Lancaster C., Stevens J.L., 1996, *Corporate Returns and Cash Conversion Cycles*, „Journal of Economics and Finance", vol. 20, no. 1.

Knauer T., Wöhrmann A., 2013, *Working capital management and firm profitability*, „Journal of Management Control", vol. 24, issue 1.

Lazaridis I., Tryfonidis D., 2006, *Relationship Between Working Capital Management And Profitability Of Listed Companies In The Athens Stock Exchange*, „Journal of Financial Management & Analysis", Jan–Jun, vol. 19, issue 1.

Louw E., Hall J.H., Pradhan R.P., 2019, *The Relationship Between Working Capital Management and Profitability: Evidence from South African Retail and Construction Firms*, „Global Business Review", vol. 12, https://doi.org/10.1177/0972150919865104.

Mahmood F., Han D., Ali N., Mubeen R., Shahza U., 2019, *Moderating Effects of Firm Size and Leverage on the Working Capital Finance – Profitability Relationship: Evidence from China*, „Sustainability", vol. 11(7).

Nastiti P.K.Y., Atahau A.D.R., Supramono S., 2019, *Working capital management and its influence on profitability and sustainable growth*, „Business: Theory and Practice", no. 20.

Nazir Mian Sajid, Afza Talat, 2009, *Impact of Aggressive Working Capital Management Policy on Firms' Profitability*, „IUP Journal of Applied Finance", vol. 15, issue 8.

Nobaneee H., AlHajjar M., 2009, *A note on Working Capital Management and Corporate Profitability of Japanese Firms*, „SSRN Working Paper Series", no. 9, http://ssrn.com/abstract=1433243 [access 30.09.2020].

Prasad P., Sivasankaran N., Shukla A., 2019, *Impact of deviation from target working capital on firm profitability: Evidence from India*, „International Journal of Productivity and Performance Management", vol. 68(1).

Richards V.D., Laughlin E.J., 1980, *A cash conversion cycle approach to liquidity analysis*, „Financial Management", vol. 9.

Vuković B., Jakšić D., 2019, *The effect of working capital management on profitability: Evidence from southeast europe*, „Ekonomika poljoprivrede", vol. 66(1).

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SENSITIVITY OF THE ART MARKET TO PRICE VOLATILITY

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Abstract

The purpose of the article: The art market becomes very popular among investors, when there is strong turbulence on the stock market. In times of calm, the art market is used by investors to diversify risk and build more efficient investment portfolios according to the Markovitz's theory. The aim of this paper is to: (i) present the peculiarity of investment on the art market, represented by art market indexes in comparison to traditional investments in other financial market segments (money market, equity indexes and commodity market), (ii) to verify the hypothesis of normality of the distribution of rates of return of the analyzed art market indices as well as (iii) to analyze calendar effects occurrence on the art market.
Methodology: Comparison of rates of return on the stock, bond, commodity and money markets with rates on the art market in four different time intervals. For each of the analyzed periods, an income-risk map was presented, taking into account the spectrum of financial instruments, including six art indexes: Old Masters, 19th Century, Modern art, Post War art, Contemporary art and Global art. The hypothesis of normality of the distribution of rates of return of the art market indices for four analyzed periods was verified with the use of Jarque-Bera test.
Results of the research: Comparison of rates of return on the stock market and art market leads to the conclusion that their relationship depends on the period chosen. For two of the analyzed periods, the rates of return on the stock market were higher than on the art market, but for others periods, the opposite. The distribution of quarterly rates of return resulted to be a normal distribution for almost all of analyzed indices and time periods. Calendar effects were observed in the case of four analyzed indexes.

Keywords: art market, art indexes, financial market efficiency, normal distribution.

JEL Class: G10, G14.

INTRODUCTION

Taking the perspective of financial economics, works of art may be treated as investments. In this approach the purchase of a work of art is aimed at achieving positive returns of the investment in the future. Investments on the art market may be confronted to other forms of investment, i.e. investing in: securities, real estates, precious metals (gold, platinum, silver), precious stones (diamonds), investable alcohols (wine, whisky) as well as in numerous collectors' items. Consequently, many authors have studied the returns of the art market, as well as their correlation with the returns of more conventional assets such as equities and bonds, in order to assess the potential benefits of investing versus such alternatives.

Downturn of economy results in reduction of confidence in intangible financial instruments, and thus investment on the art market may gain on importance. Art, as tangible investment, represents a value storage mean; having the ability to maintain the value in unfavorable external conditions.

A key challenge to study returns in this market is that the relevant prices are not as clearly defined as in other markets. Taking stocks into consideration: the return r between t_1 and t_2, may be expressed as: $\frac{P_2}{P_1} - 1$, where P_1 and P_2 represent the corresponding stock prices. Thus returns on the stock market may be considered as well-defined quantities. A return computed in such a way is the real (*ex post*) return; it is not an estimate, because P_1 and P_2 are observed prices at the times of interest. Hence, there is no error associated with r computing. It seems that the same reasoning may be the use in case of art market indexes instead of prices of individual works of art.

Art market is characterized by features differentiating it from the securities market, e.g. features of objects of investment, necessity to ensure special maintenance conditions, classification of objects of investment, character of ownership, market classification (primary, secondary), institutional markets (auctions, stock exchanges) and informal markets, frequency of organizing auctions and stock exchange sessions, availability of information on prices of concluded transactions, price indices used for art markets and securities markets [Białynicka-Birula 2013, access 7.11.2019].

The aim of this paper is to present the peculiarity of investment on the art market, represented by art market indexes in comparison with traditional investments in other financial market segments (money market, equity indexes and commodity market). Special attention will be paid to basic categories related to any investment, namely risk and rates of return. Risks connected with works of art will be identified with respect to the concept of system approach to art market. Another aim of the paper is verification of the hypothesis of normality of

the distribution of rates of return of the analyzed art market indices as well as the analysis of the calendar effects for art market indexes.

In the scientific literature, there are very few studies on the normality of distribution rates of return and calendar effects on the art market. In the following article the use of art market indexes made it possible to conduct an analysis of the normality of the distribution of rates of return of these indexes, as well as allowed to conduct an analysis regarding the effectiveness of the art market in terms of the occurrence of calendar effects.

1. LITERATURE REVIEW

Anderson was the first researcher who explored the art market with the use of econometric tools [Anderson 1974: 13–26]. Using sales data for the period of 1643–1970, he presented the model based on the art market returns as well as on the common stocks returns. He also suggested that art market returns were higher compared to returns assessed for stocks in recent years, but emphasized that there were important differences depending on the artists and the type of school or movement.

Hsieh et al. [2010, access 7.06.2020] proved that in the period from 2000 to 2009 Asian Contemporary and Modern Art had a positive performance (8.39%) and outperformed returns of four stock markets, including the Hang Seng Total Return Index (HK), –0.67%, the Shanghai Stock Market Comprehensive Stock Price Index (SH), 1.58%, the S&P 500 Stock Index (SP), –7.01%, and the Taiwan Stock Exchange Corporation Weighted Index (TW), –4.46%.

Kraeussl and Logher analyzing performance and risk-return characteristics of three major emerging art markets: Russia, China, and India, on the basis of the hedonic index, proved that the geometric annual returns were equal to 10.00%, 5.70%, and 42.20% for Russia (1985–2008), China (1990–2008), and India (2002–2008), respectively (The period covered by the analysis is shown in brackets) [Kraeussl and Logher 2010: 301–318]. The rates of return on the art market in Russia and India were higher than the rates of return of the S&P 500 index at the same time intervals. The situation on the Chinese art market was different.

Baumol [1986: 10–14] contrasted the painting market to the stock market and underlined that in the case of stocks the intrinsic value is known whereas in the art market such concept is imprecise. On the basis of the data for 640 painting transactions between 1652 and 1961, he concluded that returns on the art market were lower compared with those of government securities and exhibited a remarkable degree of variability. According to the author the process of predicting art market prices was extremally difficult. Broad academic literature found that than the returns on the art market are lower than those on stocks, confirming earlier works of Baumol [Frey and Eichenberger 1995: 528–537;

Burton and Jacobsen 1999: 193–212]. Higgs constructed a quarterly hedonic price index for 64,203 artworks, created by seventy-one well-known modern and contemporary Australian artists, sold at auction houses over the period 1986–2009 [Higgs 2012: 189–209]. The study proved that that over the entire period the art market only marginally underperformed the stock and housing markets. Worthington and Higgs examining the short and long-term price linkages among major art (Contemporary Masters, French Impressionists, Modern European, 19th Century European, Old Masters, Surrealists, 20th Century English and Modern US paintings) and equity markets (S&P 500) over the period 1976–2001, found that returns on paintings are much lower and the risks much higher than in conventional financial markets [Worthington and Higgs 2003: 649–669]. David [2014, access 6.06.2020] argues that, except under very specific circumstances, art does not provide a „safe haven" for investment during times of crisis. Constructing an art price index for the French art market during, and just after the WW1 period (1911–1925), she found that, in terms of risk weighted return, gold, real-estate, bonds and stocks, outperformed art.

Renneboog and Spaenjers [2013: 36–53], built an art index that exhibited 3.97% real annual return in US dollars covering the period 1957–2007. That is, a performance similar to that of corporate bonds but characterized by higher risk. Mandel [2009: 1653–1663] published similar results for the period 1950–1999, indicating that the art returns resulted to be lower than both the S&P 500 and the Dow Jones Industrial Index, but with higher volatility. Worthington and Higgs [2004: 257–272], applying data of some specific art market segments (Old Masters, Surrealists, Impressionists, 19th Century European, etc.) found that painting returns were lower but volatility was higher when compared with more conventional assets. The results of Worthington and Higgs research confirmed conclusions presented by the many authors [Renneboog and Van Houte 1999: 331–357; Ashenfelter and Graddy 2003: 763–786; Agnello 2006, access 12.02.2020]. Campbell [2008: 64–81] summarizes art market returns obtained by different authors for different segments and time-periods. A comprehensive literature review regarding returns can be found in the paper by Renneboog and Spaenjers [Renneboog and Spaenjers 2013: 36–53].

A big set of recent studies proved that there may be value in including art in investment portfolios, due to negative correlation with other assets returns [Ashenfelter and Graddy 2003: 763–786; Mei and Moses 2002: 1656–1668; Taylor and Coleman 2011: 1519–1529]. Boyer found that there was a negative relationship between stock market performance and the art price index on the US market [Boyer 2011: 77–83]. She developed the „diversity hypothesis" suggesting that in the periods when stocks perform well, people invest less in art. However, when the stock market index is lagged by two months, its relationship with the art price index is positive.

Goetzmann et al. created an art price index of repeated sales for the period of 1765–2007 [Goetzmann et al. 2009]. Moreover they also built an index of British

stock price returns for the analyzed period that covered dividend return, total return and capital appreciation, which was then compared to the art market returns. Results indicated a strong relationship between art and equity markets and that art prices are driven by capital gains and losses. Financial markets react quickly to economic shocks, and that the profits generated on these markets may be invested in art. Botha et al. analyzed the Citadel art price index in relation to the movement of the FSTE/JSE All Share Index, the Absa house price index, and the South African government bond index [Botha et al. 2016: 358–368]. They came to the conclusion that when there are increased returns on the stock markets in the preceding period and wealth increases, there is a change in the Citadel art price index in the same direction. Of the four asset classes, investing in art seems to be the most risky, followed by shares.

The findings regarding correlation between art returns and the returns experienced by more traditional assets seem to be more ambiguous. For example, many authors found that the art market and equities returns were highly correlated [Mandel 2009: 1635–1663]. This is in contrast with Mei and Moses [2002: 1656–1668], who concluded that paintings returns were lowly correlated with equity returns (S&P 500), as well as treasuries and corporate bonds returns. Campbell also found low correlation between art returns in general and both, stocks (MSCI world stock index), and bonds (treasury and corporates) [Campbell 2008: 64–81]. Worthington and Higgs detected a 16% correlation between art and large capitalization stocks and a –31% correlation between art and small caps [Worthington and Higgs 2004: 257–272]. Renneboog and Spaenjers reported a –3% correlation between art and the S&P 500 index, a 20% value in the case of global stocks, and somewhat higher values (in the 30–45% range) when comparing commodities and real estate indexes [Renneboog and Spaenjers 2013: 36–53]. Clearly, some of these discrepancies may be explained by different time periods, different art market segments, and the application of different techniques to estimate returns. However, it is difficult to make solid statements regarding the correlation between the art market (or some segments of it) and broader market indexes.

Charlin and Cifuentes estimated the correlation between the returns of the S&P 500 index based portfolio and paintings of two artists: Picasso and Renoir and two groups of artists (Surrealists and Impressionists) in the period of March 1985−December 2014 [Charlin and Cifuentes 2017: 128–131]. Unlike previous studies that relied on single-point estimates of the correlation to explore the merits of adding art assets to a portfolio of stocks, the authors relied on a wild bootstrap algorithm to determine confidence intervals for the correlation estimates. The authors found that these confidence intervals were so wide that it seemed impossible to make absolute remarks about the merits of adding art-related assets to stocks portfolios.

According to Renneboog and Spaenjers the Sharpe ratio for art market returns does not surpass that calculated for stock and bond returns, it is higher than for

other popular alternative asset classes, e.g. commodities and real estate [Renneboog and Spaenjers 2013: 36–53].

Using a large database with more than a million observations, David et al. [2013: 23–25] applied four tests to assess the weak form of efficiency in the art market. Results show that the art market is not even weakly efficient, since net returns are highly auto-correlated. According to the authors it is structurally impossible for auction prices to be efficient. Potential investors in the art market thus should be aware of this bias, which benefits those with insider information on reserve prices.

Kompa and Witkowska [2014: 414–428] on the basis of 750 object prices, applying hedonic index methodology to estimate returns on the Polish art market in the period 2007–2010, justified the opinion that art can be treated as safe asset class, especially in comparison to equity market.

Lucinska [2015: 67–79] calculated quarterly hedonic price indices and rates of return using 1708 auction records covering the sale of paintings by 30 painters obtained from Polish art websites at www.artinfo.pl and www.agraart.pl. She analyzed the relationship between the hedonic index and the rates of return of European (i.e. French and British) art indices. This study proved that returns on Polish art averaged 5.51 % in nominal terms over the period 2008–2012 with a standard deviation of 8.34 %. In the analyzed period the art market in Poland proved to be more profitable and more variable in comparison with European art markets.

2. DESCRIPTION OF THE RESEARCH APPROACH

The increased interest in the art market has contributed to the creation of specialized indexes, however, due to the specific features of this market presented in the previous parts of the paper, in particular the low liquidity and heterogeneous nature of trading objects, the construction of the art market index is a more complex task than in the case of classic assets. Among the existing methods of constructing art market indexes, two main approaches are distinguished, namely repeat sales models that consider price changes of objects sold at least twice, and hedonic models that allow estimating changes in the value of a work resulting from the passage of time.

There are many analytical websites publishing this type of art market indicators, the most important include AMR, Artprice, Artnet, Sotheby's Mei& Moses. For the purpose of this work, indexes from the Artprice website will be used. In addition to developing indicators, the company also publishes reports on the condition of the art market as well as analyzes of individual artists. The choice of this site was dictated primarily by the availability of one of the most extensive

databases, as Artprice reported over 30 million auction results from 4,500 auction houses from around the world [www1, access 7.11.2019].

For the purpose of this paper, the Global Art Index and the following indexes representing individual segments in art will be used [www2, access 7.11.2019; *Art Market Trends 2010*, access 7.11.2019; *The Art Market in 2018*, access 7.10.2019]:

1) Old Masters – referring to the works of artists born before 1760;

2) 19th Century (19th Century works) – referring to the works of artists born between 1760 and 1860;

3) Modern art – referring to works of artists born between 1860 and 1920;

4) Post War art (post-war works) – referring to the works of artists born between 1920 and 1945;

5) Contemporary art – referring to works of artists born after 1945.

All of the analyzed indexes are repeated sales indexes.

The Artprice indexes are constructed on the basis of public auctioning. Auction turnover covers about half of all transactions on the art market. In addition, the premium paid by the buyer is not included in the process of building Artprice indicators, which could lead to distorted results. Considering the imperfections of the art market, it should be remembered that art indexes that have some disadvantages may not fully represent the real situation of this market. Nevertheless, they are one of the best tools illustrating the condition of the art market and enabling comparison of this market with others in terms of investment efficiency.

In order to compare the art market with the traditional market, the following equity indexes were used for the analysis:

1) CAC40, Nikkei225, DAX, UK100, WIG20, NASDAQ, DJIA,

2) LCS – MSCI USA Large Cap Index (published by Morgan Stanley),

3) SMID – MSCI USA Small and Mid Cap Index (published by Morgan Stanley).

In addition, money market indices and inflation indicator were applied:

1) GB – ICE BofA Current 10-Year Treasury Index mapping the prices of 10-year US Treasury bonds.

2) CB – ICE BofA Corporate Index, reflecting the prices of USD--denominated investment grade corporate bonds (Moody's, S&P, Fitch).

3) CPI – US inflation rate.

The following commodity prices were also analyzed: BRENT oil, gold, silver and copper.

3. METHODOLOGY

The study was divided into the following parts:

1) Four periods were chosen:
   (i) T1 – before the financial crisis (Q4 2001–Q4 2007),
   (ii) T2 – financial crisis (Q1 2008–Q2 2009),
   (iii) T3 – after the financial crisis (Q3 2009–Q4 2018),
   (iv) T4 – the entire available data in the database (Q4 1997–Q4 2018).

The beginning of the first period was set at a time when the stock market stabilized after the depreciation of internet companies' rally (March 2000–July 2001).

The second period represents the 2008–2009 financial crisis and the third period covers the increase of prices on equity markets (the lowest prices on the equity markets were registered in the beginning of 2009).

Logarithmic returns, as well as standard deviation coefficients were calculated for each financial instruments in each of the four periods.

The values of the art indexes in the database are calculated on a quarterly basis. Therefore, it was necessary to annualize the rates of return and standard deviations for all analyzed financial instruments, e.g. (art indexes, equity indexes, money markets instruments and inflation).

2) Based on the obtained results, return-risk maps were constructed for each of the four periods.

3) The hypothesis of normality of the distribution of rates of return of the art market indices for four analyzed periods was verified. For this purpose, the Jarque-Bera test was implemented.

4) For all analyzed art market indexes, a study was conducted regarding the occurrence of calendar effects. In this case, two hypotheses were verified:

H_0: average quarter return of a given art market index is equal to the average return of the same index in the three remaining quarters (for example, the average quarterly rate of return in the first quarter is equal to the average quarterly rate of return, calculated for data from the second, third and fourth quarters),

H_1: average quarter return of a given art market index is not equal to the average return of the same index in the three remaining quarters.

4. RESULTS

4.1. Analysis of annualized returns and standard deviation coefficients

A list of annualized returns and standard deviation coefficients for the four analyzed periods is presented in Table 1.

The average rates of return were:

a) In the first period – positive for all art indexes. The highest rate of return among the art market indexes was recorded for: Post War (15.33%), and the lowest for Old Masters (5.95%);

b) In the second and third periods – negative for all art indexes. The highest rate of return among the art market indexes for the second and third period was recorded for: Old Masters (–5.13%) and Post War (–2.17%), respectively. And the lowest for 19th Century (–27.09%) and Old Masters (–7.48%), respectively;

c) In the fourth period – negative for all art indexes, except for the Post War and Contemporary indexes. The highest rate of return among the art market indexes was recorded for: Post War (2.28%), and the lowest for Old Masters (–3.07%).

On the basis of the research it can be concluded that in the overwhelming number of cases, rates of return on the art market were higher than on the stock market for the first two analyzed periods, and lower for the other two. For the art and commodity markets, the rate of return on this first market was lower than on the second.

Analysis of the volatility of the art market indexes returns allows to draw the following conclusions:

1) The most risky art index in all time intervals resulted to be Global Art;

2) The least risky index in all time intervals, except for the second period, was Modern Art. In the second period, the least risky art index was Post War.

The ranking of rates of return (1 – the highest rate of return and 22 – the lowest) for individual periods and financial instruments bring the following conclusions (see Table 2):

1) In period I, the art index with the highest rate of return was placed in the 10th place, and the lowest in the 20th place;

2) For the other periods the classification may pe presented as follows:
   a) II: 11th and 21st,
   b) III: 3rd and 20th,
   c) IV: 9th and 20th.

Table 1. Nominal returns and standard deviations coefficients for four analyzed periods

Category		LCS	SMID	GB	CB	Global Art Index	Old Masters	19th Century	Modern Art	Post War	Contemporary	CPI	CAC40	Nikkei225	DAX	UK100	WIG20	Nasdaq	DJIA	Oil BRENT	Gold	Silver	Copper
I period	Risk	13.65	15.23	7.09	4.26	15.02	10.01	7.34	5.90	9.22	12.24	1.15	20.85	16.52	27.97	13.63	16.35	19.62	13.71	22.49	10.76	24.85	24.98
	Return	3.22	8.23	5.07	5.93	9.80	5.95	6.64	9.85	15.33	14.91	2.98	1.39	4.38	4.33	2.89	16.16	3.83	4.18	24.09	18.71	19.33	22.50
II period	Risk	23.15	30.06	13.65	10.66	21.31	19.88	9.89	9.80	7.65	11.89	3.45	21.52	32.12	25.78	15.61	30.43	28.44	19.41	85.98	9.61	34.32	71.34
	Return	–33.05	–34.78	5.20	0.62	*–23.56*	*–5.13*	*–27.09*	*–21.15*	*–21.38*	*–21.35*	0.99	–41.15	–33.90	–37.87	–29.14	–45.90	–28.86	–32.07	–96.82	6.34	–13.36	–60.21
III period	Risk	12.90	16.28	7.14	4.40	25.95	10.51	9.87	5.96	7.06	14.41	0.75	16.65	19.02	18.39	13.16	16.78	14.96	12.44	33.59	15.59	28.00	22.30
	Return	9.51	10.04	3.04	5.20	*–4.74*	*–7.48*	*–5.92*	*–4.24*	*–2.17*	*–3.94*	1.71	2.82	5.51	6.49	3.96	0.65	12.38	9.91	–11.64	2.11	–2.56	–0.94
IV period	Risk	16.66	20.36	7.85	4.95	21.08	13.27	9.73	7.29	9.49	14.67	1.30	22.20	21.08	25.71	15.14	24.10	25.92	15.71	37.96	13.58	25.75	29.57
	Return	2.73	4.34	4.18	5.17	*–0.68*	*–3.07*	*–2.54*	*–0.31*	2.48	1.12	2.11	–0.47	–1.02	0.69	0.11	–1.03	3.22	3.88	–7.02	6.13	1.07	0.02

Source: own calculations.

Table 2. The ranking of rates of return and standard deviations coefficients (1 – the highest rate of return and 22 – the lowest)

Category		LCS	SMID	GB	CB	Global Art Index	Old Masters	19th Century	Modern Art	Post War	Contemporary	CPI	CAC40	Nikkei225	DAX	UK100	WIG20	Nasdaq	DJIA	Oil BRENT	Gold	Silver	Copper
I period	Risk	13.65	15.23	7.09	4.26	15.02	10.01	7.34	5.90	9.22	12.24	1.15	20.85	16.52	27.97	13.63	16.35	19.62	13.71	22.49	10.76	24.85	24.98
	Return	3.22	8.23	5.07	5.93	9.80	5.95	6.64	9.85	15.33	14.91	2.98	1.39	4.38	4.33	2.89	16.16	3.83	4.18	24.09	18.71	19.33	22.50
II period	Risk	23.15	30.06	13.65	10.66	21.31	19.88	9.89	9.80	7.65	11.89	3.45	21.52	32.12	25.78	15.61	30.43	28.44	19.41	85.98	9.61	34.32	71.34
	Return	–33.05	–34.78	5.20	0.62	*–23.56*	*–5.13*	*–27.09*	*–21.15*	*–21.38*	*–21.35*	0.99	–41.15	–33.90	–37.87	–29.14	–45.90	–28.86	–32.07	–96.82	6.34	–13.36	–60.21
III period	Risk	12.90	16.28	7.14	4.40	25.95	10.51	9.87	5.96	7.06	14.41	0.75	16.65	19.02	18.39	13.16	16.78	14.96	12.44	33.59	15.59	28.00	22.30
	Return	9.51	10.04	3.04	5.20	*–4.74*	*–7.48*	*–5.92*	*–4.24*	*–2.17*	*–3.94*	1.71	2.82	5.51	6.49	3.96	0.65	12.38	9.91	–11.64	2.11	–2.56	–0.94
IV period	Risk	16.66	20.36	7.85	4.95	21.08	13.27	9.73	7.29	9.49	14.67	1.30	22.20	21.08	25.71	15.14	24.10	25.92	15.71	37.96	13.58	25.75	29.57
	Return	2.73	4.34	4.18	5.17	*–0.68*	*–3.07*	*–2.54*	*–0.31*	2.48	1.12	2.11	–0.47	–1.02	0.69	0.11	–1.03	3.22	3.88	–7.02	6.13	1.07	0.02

Source: own calculations.

Performance of individual financial instruments and indexes in the analyzed period (Q4 1997–Q4 2018) is presented in Appendix.

4.2. Analysis of correlation coefficients

The values of correlation coefficients of rates of return on the art market and rates of return in other segments of the financial market, in analyzed time intervals, are presented in Tables 3–6.

In the first period, the lowest value of the correlation coefficient was minus 0.49 (Contemporary), and the highest 0.25 (Old Masters). A significant percentage of correlation coefficients were grouped in the ranges (–0.5; –0.1), (–0.1; 0.1) and (0.1; 0.5). The values of correlation coefficients were negative up to 14 times for the Contemporary index.

In the second period, the highest value of the correlation coefficient mounted to 0.94 (Global Art Index), while the lowest was equal to minus 0.23 (Contemporary). For this time interval, a significant percentage of correlation coefficients were higher than 0.5 or belonged to the range (0.1; 0.5). Correlation coefficient were 6 times negative for the Contemporary sector.

In the third period, the highest value of the correlation coefficient reached the level of 0.44 (Modern Art Index), while the lowest was equal to minus 0.15 (Global Art Index). As in the first time interval, a significant percentage of correlation coefficients were grouped in three ranges (–0.5; –0.1), (–0.1; 0.1) and (0.1; 0.5). Correlation coefficient values were negative 12 times for the Global Art Index.

Throughout all analyzed period (e.g. the fourth period), correlation coefficients were concentrated in the ranges (–0.1; 0.1) and (0.1; 0.5). The lowest correlation coefficient (–0.03) was recorded for the Global Art Index, and the highest (0.43) for the Modern Art index. The correlation coefficient was three times lower than zero for the Modern Art index.

The correlation coefficients calculated for the rates of return of stock indexes and the art market were low (except for the second period) in all analyzed periods.

The correlation coefficients of returns between art market indexes are also noteworthy to mention. The highest value of this type of coefficients, equal to 0.69, was recorded for the Contemporary and Post War pair, and the lowest equal to minus 0.05 for the Contemporary and Old Masters pair.

Table 3. Correlation coefficients in the first analyzed period

Category	LCS	SMID	GB	CB	Global Art Index	Old Masters	19th century	Modern Art	Post-war	Contemporary	CPI	CAC40	Nikkei225	DAX	UK100	WIG20	Nasdaq	DJIA	Oil BRENT	Gold	Silver	Copper
Global Art Index	–0.20	–0.07	0.03	–0.01	1.00	0.36	0.18	0.57	0.60	0.45	0.20	–0.10	–0.16	–0.15	–0.13	0.00	–0.13	–0.22	0.20	0.06	0.08	–0.02
Old Masters	0.15	0.21	0.03	0.19	0.36	1.00	–0.31	0.21	0.22	–0.07	0.08	0.13	–0.08	0.07	0.15	0.25	0.19	0.15	0.03	0.21	0.03	0.04
19th century	–0.17	–0.22	0.10	0.01	0.18	–0.31	1.00	0.44	0.33	0.24	–0.06	–0.29	–0.36	–0.30	–0.33	–0.39	–0.15	–0.12	0.00	–0.16	–0.05	–0.01
Modern Art	0.15	0.18	–0.18	–0.10	0.57	0.21	0.44	1.00	0.56	0.39	–0.15	0.08	–0.21	0.06	0.10	–0.01	0.21	0.19	–0.06	0.01	0.01	–0.03
Post-war	–0.05	0.08	0.09	0.11	0.60	0.22	0.33	0.56	1.00	0.71	–0.10	–0.05	–0.13	–0.08	–0.09	–0.02	–0.05	–0.04	0.05	–0.24	–0.03	–0.05
Contemporary	0.05	0.13	–0.12	–0.17	0.45	–0.07	0.24	0.39	0.71	1.00	0.08	0.08	–0.01	0.08	0.03	0.06	0.05	0.05	0.07	–0.49	–0.33	–0.07

Source: own calculations.

Table 4. Correlation coefficients in the second analyzed period

Category	LCS	SMID	GB	CB	Global Art Index	Old Masters	19th century	Modern Art	Post-war	Contemporary	CPI	CAC40	Nikkei225	DAX	UK100	WIG20	Nasdaq	DJIA	Oil BRENT	Gold	Silver	Copper
Global Art Index	0.66	0.71	–0.48	0.83	1.00	0.41	0.49	0.48	0.37	0.19	0.26	0.67	0.85	0.75	0.94	0.55	0.64	0.52	0.54	0.17	0.44	0.28
Old Masters	0.74	0.74	–0.58	0.08	0.41	1.00	0.76	0.75	0.39	0.05	0.82	0.62	0.54	0.57	0.46	0.60	0.58	0.76	0.67	–0.12	–0.05	0.47
19th century	0.58	0.62	–0.47	0.31	0.49	0.76	1.00	0.95	0.89	0.66	0.74	0.37	0.44	0.28	0.37	0.41	0.46	0.53	0.77	0.55	0.57	0.76
Modern Art	0.72	0.73	–0.55	0.43	0.48	0.75	0.95	1.00	0.86	0.59	0.74	0.53	0.51	0.41	0.45	0.62	0.59	0.70	0.80	0.48	0.53	0.81
Post-war	0.37	0.43	–0.36	0.38	0.37	0.39	0.89	0.86	1.00	0.91	0.54	0.16	0.29	0.04	0.21	0.24	0.33	0.28	0.70	0.84	0.85	0.83
Contemporary	0.07	0.15	–0.23	0.24	0.19	0.05	0.66	0.59	0.91	1.00	0.36	–0.12	0.10	–0.23	–0.02	–0.08	0.12	–0.07	0.55	0.92	0.93	0.75

Source: own calculations.

Table 5. Correlation coefficients in the third analyzed period

Category	LCS	SMID	GB	CB	Global Art Index	Old Masters	19th century	Modern Art	Post-war	Contemporary	CPI	CAC40	Nikkei225	DAX	UK100	WIG20	Nasdaq	DJIA	Oil BRENT	Gold	Silver	Copper
Global Art Index	–0.06	–0.05	–0.32	–0.36	1.00	–0.11	0.28	0.26	0.33	0.28	0.07	–0.14	0.11	0.00	–0.02	–0.02	–0.15	–0.01	0.05	–0.14	–0.12	0.16
Old Masters	–0.07	0.02	0.05	0.05	–0.11	1.00	–0.07	0.08	–0.24	–0.16	0.21	0.01	–0.09	0.02	–0.07	–0.01	–0.12	–0.05	0.29	0.05	0.13	–0.11
19th century	0.20	0.24	–0.29	–0.05	0.28	–0.07	1.00	0.49	0.52	0.40	0.41	0.17	0.09	0.05	0.28	0.20	0.19	0.12	0.34	0.07	0.29	0.32
Modern Art	0.44	0.51	–0.56	–0.18	0.26	0.08	0.49	1.00	0.60	0.70	0.35	0.43	0.28	0.36	0.42	0.38	0.40	0.43	0.44	0.02	0.36	0.41
Post-war	0.37	0.44	–0.43	–0.10	0.33	–0.24	0.52	0.60	1.00	0.82	0.17	0.30	0.19	0.27	0.36	0.26	0.30	0.35	0.22	0.05	0.34	0.43
Contemporary	0.39	0.46	–0.47	–0.17	0.28	–0.16	0.40	0.70	0.82	1.00	0.29	0.29	0.21	0.26	0.33	0.18	0.36	0.37	0.40	0.07	0.37	0.38

Source: own calculations.

Table 6. Correlation coefficients in the fourth analyzed period

Category	LCS	SMID	GB	CB	Global Art Index	Old Masters	19th century	Modern Art	Post-war	Contemporary	CPI	CAC40	Nikkei225	DAX	UK100	WIG20	Nasdaq	DJIA	Oil BRENT	Gold	Silver	Copper
Global Art Index	–0.06	–0.05	–0.32	–0.36	1.00	–0.11	0.28	0.26	0.33	0.28	0.07	–0.14	0.11	0.00	–0.02	–0.02	–0.15	–0.01	0.05	–0.14	–0.12	0.16
Old Masters	–0.07	0.02	0.05	0.05	–0.11	1.00	–0.07	0.08	–0.24	–0.16	0.21	0.01	–0.09	0.02	–0.07	–0.01	–0.12	–0.05	0.29	0.05	0.13	–0.11
19th century	0.20	0.24	–0.29	–0.05	0.28	–0.07	1.00	0.49	0.52	0.40	0.41	0.17	0.09	0.05	0.28	0.20	0.19	0.12	0.34	0.07	0.29	0.32
Modern Art	0.44	0.51	–0.56	–0.18	0.26	0.08	0.49	1.00	0.60	0.70	0.35	0.43	0.28	0.36	0.42	0.38	0.40	0.43	0.44	0.02	0.36	0.41
Post-war	0.37	0.44	–0.43	–0.10	0.33	–0.24	0.52	0.60	1.00	0.82	0.17	0.30	0.19	0.27	0.36	0.26	0.30	0.35	0.22	0.05	0.34	0.43
Contemporary	0.39	0.46	–0.47	–0.17	0.28	–0.16	0.40	0.70	0.82	1.00	0.29	0.29	0.21	0.26	0.33	0.18	0.36	0.37	0.40	0.07	0.37	0.38

Source: own calculations.

Table 7. Summary of the number of correlation coefficients in individual ranges

Number of cases	<–0.5	(–0.5; –0.1)	(–0.1; 0.1)	(0.1; 0.5)	>0.5	Max	Min	Total max of correlation coefficient	Total min of correlation coefficient	<0
First period (T1)										
Global Art Index	0	6	8	5	2	0.20	–0.22	0.25	–0.49	10
Old Masters	0	1	8	12	0	0.25	–0.08			1
19th Century	0	11	6	4	0	0.00	–0.39			14
Modern Art	0	4	8	7	2	0.21	–0.21			7
Post War	0	3	12	3	3	0.05	–0.24			12
Contemporary	0	4	12	4	1	0.08	–0.49			6
Second period (T2)										
Global Art Index	0	1	0	9	11	0.94	0.17	0.94	–0.23	1
Old Masters	1	1	4	3	12	0.76	–0.12			3
19th Century	0	1	0	8	12	0.77	0.28			1
Modern Art	1	0	1	4	15	0.81	0.41			1
Post War	0	1	1	11	8	0.85	0.04			1
Contemporary	0	3	6	5	7	0.93	–0.23			6
Third period (T3)										
Global Art Index	0	7	8	6	0	0.16	–0.15	0.44	–0.15	12
Old Masters	0	5	13	3	0	0.29	–0.12			7
19th Century	0	1	5	14	1	0.34	0.05			2
Modern Art	1	1	3	13	3	0.44	0.02			2
Post War	0	2	2	14	3	0.43	0.05			2
Contemporary	0	3	1	15	2	0.40	0.07			2
Fourth period (T4)										
Global Art Index	0	1	11	9	0	0.18	–0.03	0.43	–0.03	3
Old Masters	0	1	4	16	0	0.41	0.08			1
19th Century	0	1	2	17	1	0.34	0.09			1
Modern Art	0	1	1	16	3	0.43	0.19			1
Post War	0	1	2	16	2	0.32	0.06			1
Contemporary	0	1	6	12	2	0.30	0.05			1

Source: own calculations.

4.3. Risk-reward maps for specific periods

Maps showing the location of individual asset classes, taking into account the rates of return and risk (standard deviation) are presented in Chart 1–4.

For the first investment period, the following art market indexes are located most north of other assets with similar investment risk: Modern Art and Post War. The 19th Century Index location on the map may be considered as less favorable.

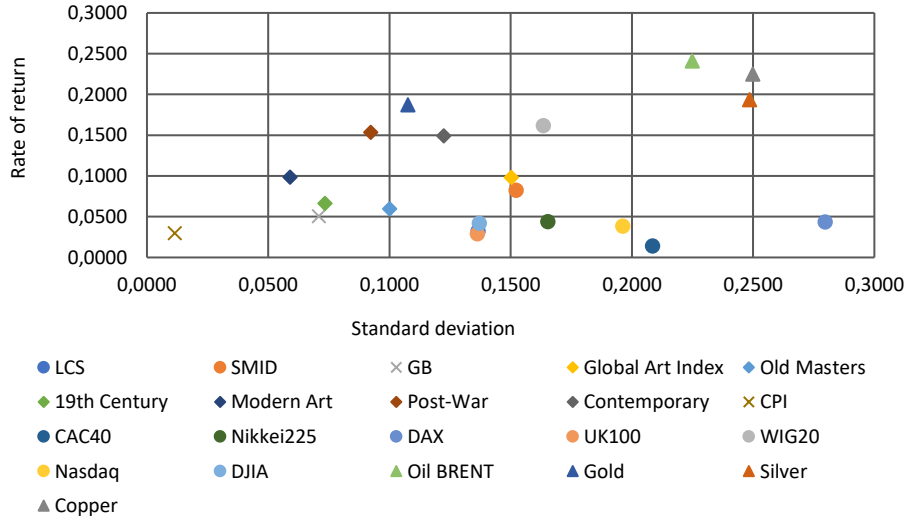

Chart 1. Risk-reward map for the first subperiod

Source: own calculations.

In the second period, dominated by negative rates of return, the location of such art market indices as Post War, Modern Art, Contemporary and 19th Century (characterised by low investment risk) had a slightly negative returns. This fact deserves attention. The investment risk for the Old Masters index was greater than for above mentioned four indices, but the rate of return was higher, although still negative. The investment risk of the Old Master index was similar to the risk of investment in the portfolio replicating the Global Art Index. In the case of the latter index, the investment risk in the analyzed period was the highest among all art market indexes. Similar investment risk to that of the four above-mentioned indices (Post War, Modern Art, Contemporary and 19th Century) was registered in the case of gold, but its return remains positive.

From the portfolio theory point of view, the locations of art market indexes on the map in the third period are not favorable. All indexes are characterised by negative rates of return with relatively low risk, except of the Global Art Index. Attention should be paid to the favorable location of stock market indices.

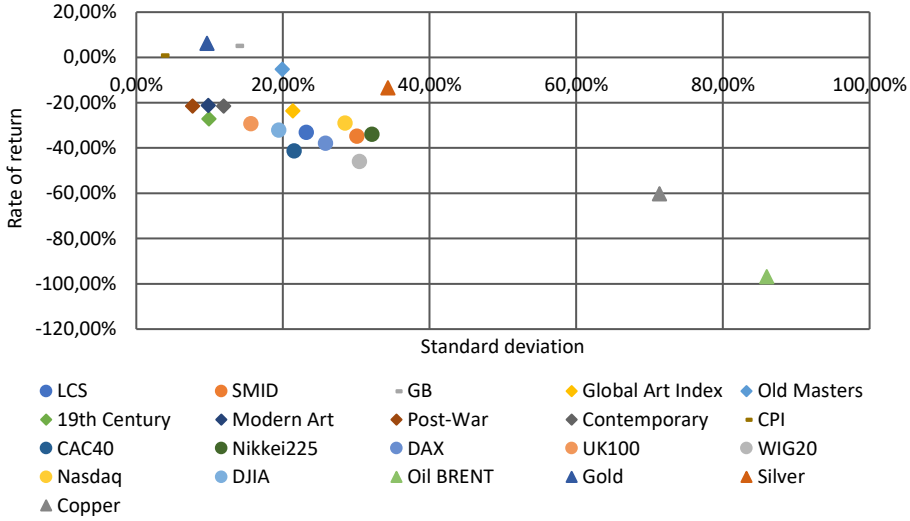

Chart 2. Risk-reward map for the second subperiod

Source: own calculations.

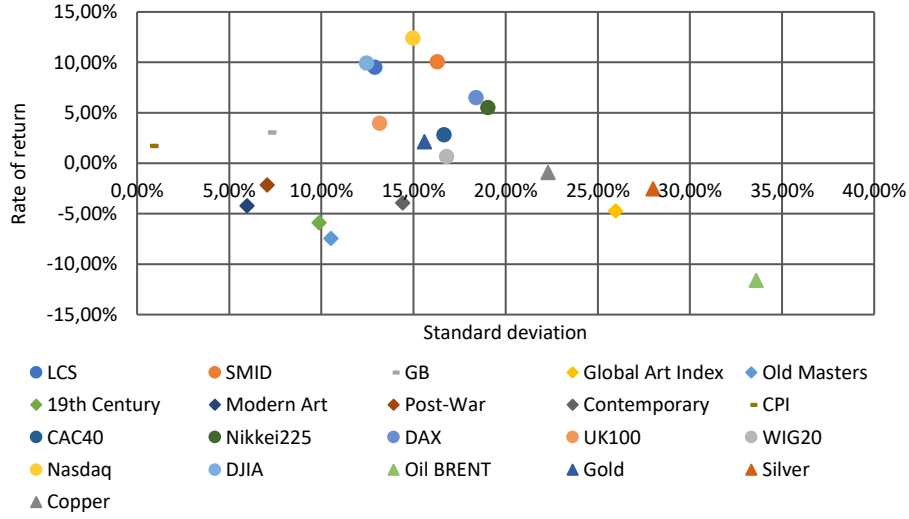

Chart 3. Risk-reward map for the third subperiod

Source: own calculations.

In the entire analyzed investment period (the four period), the following art market indexes are located close to the effective portfolios curve: Post War and Modern Art. The returns of 19th Century and Old Masters indexes were negative, but the risks assigned to these two instruments were the same as the risks of the following financial instruments: Post War and gold, respectively. Investments in the portfolio replicating the Contemporary index were characterized by a positive rate of return with a slightly higher risk than the Old Masters index. The last position in this raking is occupied by Global Art Index, which with the highest risk for the art market indexes, offered a negative rate of return. The high profit/risk ratio was assigned to the gold market.

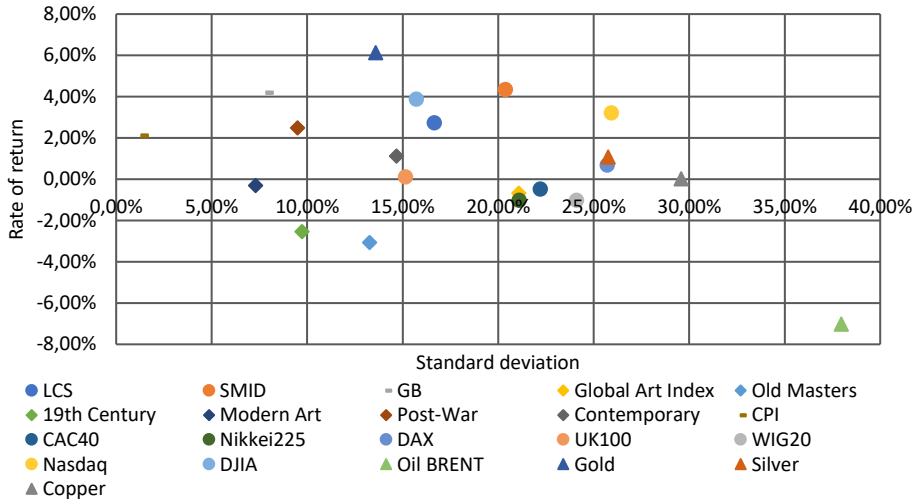

Chart 4. Risk-reward map for the fourth period (all available data)

Source: own calculations.

4.4. Analysis of the coefficient of variation

For each of the financial instruments, the coefficient of variation (risk measure divided by the rate of return) was calculated, and then a ranking was created according to the following criteria (see Table 8). The highest positions in the ranking are occupied by instruments with the lowest coefficient of variation, assuming that it is positive. Subsequently, instruments with the highest negative coefficient of variation were classified.

Table 8. Variation coefficient and the ranking of financial instruments

Position in ranking	1st subperiod		2nd subperiod		3rd subperiod		All analyzed period (4th period)	
	V. Coeff.	Instument	V. Coeff.	Instument	V. Coeff.	Instument	V. Coeff.	Instument
1	0.39	CPI	1.52	Gold	0.44	CPI	6.10	LCS
2	0.58	Gold	2.62	GB	0.84	CB	4.69	SMID
3	0.60	**Modern Art**	3.50	CPI	1.21	Nasdaq	1.88	GB
4	0.60	**Post War**	17.26	CB	1.25	DJIA	0.96	CB
5	0.72	CB	–0.36	**Post War**	1.36	LCS	–31.17	**Global Art Index**
6	0.82	**Contemporary**	–0.36	**19th Century**	1.62	SMID	–4.33	**Old Masters**
7	0.93	Oil BRENT	–0.46	**Modern Art**	2.35	GB	–3.83	**19th Century**
8	1.01	WIG20	–0.52	CAC40	2.83	DAX	–23.27	**Modern Art**
9	1.11	**19th Century**	–0.54	UK100	3.32	UK100	3.82	**Post-war**
10	1.11	Copper	–0.56	**Contemporary**	3.45	Nikkei225	13.09	**Contemporary**
11	1.29	Silver	–0.61	DJIA	5.90	CAC40	0.62	CPI
12	1.40	GB	–0.66	WIG20	7.38	Gold	–46.81	CAC40
13	1.53	**Global Art Index**	–0.68	DAX	25.88	WIG20	–20.63	Nikkei225
14	1.68	**Old Masters**	–0.70	LCS	–1.40	**Modern Art**	37.30	DAX
15	1.85	SMID	–0.86	SMID	–1.40	**Old Masters**	140.41	UK100
16	3.28	DJIA	–0.89	Oil BRENT	–1.67	**19th Century**	–23.50	WIG20
17	3.78	Nikkei225	–0.90	**Global Art Index**	–2.89	Oil BRENT	8.05	Nasdaq
18	4.24	LCS	–0.95	Nikkei225	–3.25	**Post-war**	4.05	DJIA
19	4.72	UK100	–0.99	Nasdaq	–3.66	**Contempo-rary**	–5.41	Oil BRENT
20	5.12	Nasdaq	–1.18	Copper	–5.48	**Global Art Index**	2.22	Gold
21	6.46	DAX	–2.57	Silver	–10.94	Silver	24.02	Silver
22	15.00	CAC40	–3.88	**Old Masters**	–23.61	Copper	1260.05	Copper

Source: own calculations.

In the first analyzed sub-period, four art market indexes were classified in the top ten (ranking in brackets): Modern Art (3), Post War (4), Contemporary (6) and 19th Century (9). In the second sub-period, the same indexes are included in the top ten ranking, only in different places: Post War (5), 19th Century (6), Modern Art (7) and Contemporary (10). In turn, in the third sub-period all art

market indexes were classified except for the top ten: Modern Art (14), Old Masters (15) and 19th Century (16). In the ranking created for the entire analyzed period, all art market indexes were placed in the top ten, in positions from 5 to 10. The following three indexes were classified in the first three places: Global Art Index (5), Old Masters (6) and 19th Century (7).

4.5. Analysis of the normality of the distribution of rates of return and calendar effects

Although in the last three decades the validity of this assumption has been widely rejected because of the strong leptokurtosis of financial variables, the normal distribution is still the assumption underlying most of the methods used in empirical finance. Most scientific papers are devoted to examining the normality of distribution on the stock, commodity or currency market. Therefore, it is interesting to verify the hypothesis about the normality of distribution of rates of return in one of the financial market segments, i.e. the art market.

The analysis of normal distribution of rates of return and the occurrence of calendar effects was proceeded for:

a) all art market indexes,

b) individual quarters (and for all four quarters in the case of normal distribution).

The results are presented in Table 9.

Table 9. p-value coefficients calculated in the process of analyzing the normality of distribution of returns and the occurrence of calendar effects (p-value less than 0.05 in italics).

Art. Market index	Calendar effects (z statistic)				Normal distribution of returns (Jarque-Bera test)				
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	All data
Global Art Index	0.2600	0.1010	*0.0000*	*0.0005*	0.5939	0.7632	*0.0000*	0.4364	0.1505
Old Masters	0.1987	0.9157	0.2130	0.8204	0.4732	0.7953	0.4022	0.8553	0.7238
19th Century	0.7779	0.7581	0.7554	0.8277	0.5827	0.7166	0.5565	0.8410	0.6242
Modern Art	*0.0291*	*0.0449*	*0.0237*	0.2467	0.5299	0.5523	0.9575	*0.0145*	0.0777
Post War	*0.0115*	*0.0489*	*0.0011*	0.0535	0.8485	0.3765	0.8913	0.2946	0.6007
Contempo-rary	*0.0045*	0.8703	*0.0028*	0.8190	0.0758	0.4967	0.1022	0.4428	0.7076

Source: own calculations.

In the case of the analysis of the normality of the distribution of returns, the null hypothesis was rejected in two cases (the p value in brackets):

a) Returns in the 3rd quarter of the Global Art Index (0.0000),

b) Returns in the 4th quarter of the Modern Art index (0.0145).

In other cases, there were no reasons for rejecting the null hypothesis. Generally, it can be concluded that the distribution of quarterly rates of return was a normal distribution for all analyzed indices.

The Efficient Market Hypothesis is a cornerstone of modern investment theory that essentially advocates the futility of information in generation of abnormal returns in capital markets over a period of time. However, the existence of anomalies challenge the notion of efficiency in stock markets. Calendar effects, in particular, violate the weak form of efficiency, highlighting the role of past patterns and seasonality in estimating future prices. Calendar effects were observed for the following indexes (p value parameter in brackets):

a) Global Art Index: 3Q (0.0000) and 4Q (0.0005),

b) Modern Art: 1Q (0.0291), 2Q (0.0449) and 3Q (0.0237),

c) Post War: 1Q (0.0115), 2Q (0.0489) and 3Q (0.0011),

d) Contemporary: 1Q (0.0045) and 3Q (0.0028).

In the case of Old Masters and 19th Century, no calendar effects were found. Thus, calendar effects occurred in 10 out of 24 analyzed cases (41.67%).

CONCLUSIONS

Comparison of rates of return on the stock and art markets leads to the conclusion that their relationship depends on the period chosen. In some of these periods, the rates of return on the stock market were higher than calculated for other segments of financial market. However, in other periods this relationship was inverse. For example, in the longest analyzed period, rates of return on the art market were lower than on the stock market. In the overwhelming number of cases the rates of return on the commodity market were higher than on the art market. A similar relation occurred also for the money and art market – the returns on the money market were higher than on the art market (except for the first analyzed period).

In turn, comparing the volatility on the following markets: art, commodity and stocks allow to draw the conclusion that the volatility on the art market was lower than the volatility in the other two segments of the financial market. By confronting the volatility of the art and the money market, one can conclude that they are comparable. Furthermore, it can be ascertain that the distribution of quarterly returns on the art market was mostly a normal distribution. The analysis of the effectiveness of the art market led to the conclusion that calendar effects are

present on this market (differences in returns in individual quarters) except indexes: Old Masters and 19th Century.

The conclusions presented in this article for the first and second analyzed periods, confirms earlier works, maintaining that the rates of return on the art market are higher than on the stock market [Anderson 1974: 13–26; Hsieh et al. 2010, access 7.06.2020; Kraeussl and Logher 2010: 301–318].

The obtained results for the third and fourth analyzed period are in line with conclusions published by the authors, who claimed that the rates of return on the art market are lower than rates on the stock market [Baumol 1986: 10–14; Frey and Eichenberger 1995: 528–537; Burton and Jacobsen 1999: 193–212; Agnello 2006, access 12.02.2020; Renneboog and Van Houte 1999: 331–357; Worthington and Higgs 2003: 649–669; Ashenfelter and Graddy 2003: 763–786; Mandel 2009: 1653–1663; Higgs 2012: 189–209; David 2014].

In turn, the results presented in the article regarding the low correlation of rates of return on the stock and art market, are consistent with the observations published by other researchers [Mei and Moses 2002: 1656–1668; Ashenfelter and Graddy 2003: 763–786; Worthington and Higgs 2004: 257–272; Campbell 2008: 64–81; Taylor and Coleman 2011: 1519–1529; Renneboog and Spaenjers 2013: 36–53], while they deny the outcomes presented by Mandel [2009: 1635–1663].

The occurrence of calendar effects for the six analyzed art market indexes is in line with the conclusions of David's work on the effectiveness of the art market [David et al. 2013: 23–25].

Similar tests should also be proceeded in other time intervals, e.g. on an annual, two, three, four and five year basis, as well as for other art market indexes, including hedonic ones. This analysis can also be extended for other stock market indices, as well as for other commodities.

BIBLIOGRAPHY

Agnello R., 2006, *Do U.S. Paintings Follow The CAPM? Findings Disaggregated By Subject, Artist, And Value Of The Work*, https://ideas.repec.org/p/dlw/wpaper/06-02.html [access 12.02.2020].

Anderson R., 1974, *Paintings As An Investment*, „Economic Inquiry", vol. 12.

Art Market Trends 2010, https://imgpublic.artprice.com/pdf/trends2010_en.pdf [access 7.11.2019].

The Art Market In 2018, https://www.artprice.com/artprice-reports/the-art-market-in-2018 [access 7.10.2019].

Ashenfelter O., Graddy K., 2003, *Auctions And The Price Of Art*, „Journal of Economic Literature", vol. 41.

Baumol J., 1986, *Unnatural Value: Or Art Investment As A Floating Crap Game*, „American Economic Review", vol. 76.

Białynicka-Birula J., 2013, *Investment In Art – Specificity, Risks, And Rates Of Return*, „Proceedings of the 14th International Conference on Finance and Banking", Ostrava; http://icfb.rs.opf.slu.cz/content/conference-proceedings [access 7.11.2019].

Botha F., Snowball J., Scott B., 2016, *Art Investment in South Africa: Portfolio Diversification And Art Market Efficiency*, „South African Journal of Economic and Management Sciences", vol.19(3).
Boyer C., 2011, *The Market For Fine Art And The Economy*, „Journal of Wealth Management", vol. 13(4).
Burton B., Jacobsen J., 1999, *Measuring Returns On Investments In Collectibles*, „Journal of Economic Perspectives", vol. 13.
Campbell R., 2008, *Art As A Financial Investment*, „Journal of Alternative Investments", vol. 10(4).
Charlin V., Cifuentes A., 2017, *On The Correlation Between Stocks And Art Market Returns*, „Applied Economic Letters", vol. 24(2).
David G., 2014, *Is Art Really A Safe Haven? Evidence From The French Art Market During WW1*, „Centre Emile Bernheim (CEB) Working Paper", vol. 14/025, https://dipot.ulb.ac.be/dspace/bitstream/2013/176148/1/wp14025.pdf [access 6.06.2020].
David G., Oosterlinck K., Szafarz A., 2013, *Art Market Inefficiency*, „Economics Letters", vol. 121.
Frey B., Eichenberger R., 1995, *On The Role Of Return In The Art Market: Survey And Evaluation*, „European Economic Review", vol. 39.
Goetzmann W., Renneboog L., Spaenjers C., 2009, *Art And Money*, „NBER Working Paper", no. 15502, Massachusetts: National Bureau of Economic Research.
Higgs, H., 2012, *Australian Art Market Prices During The Global Financial Crisis And Two Earlier Decades*, „Australian Economic Papers", vol. 51(4).
Hsieh S., Lee J., Tzeng L., 2010, *Art As An Investment: Empirical Study Of Asian Contemporary And Chinese 20th Century Modern Art, International Conference On Finance Department Of Finance*, National Taiwan University, December 10–11, 2010, *Discussion Paper*. http://www.fin.ntu.edu.tw/~conference/conference2010/proceedings/proceeding/11/11-1(A40).pdf [access 7.06.2020].
Kompa K., Witkowska D., 2014, *Returns Form The Art Market, Price Index Evaluated For The Most-Traded Polish Painters*, „Quantitative Methods in Economics", vol. 15(2).
Kraeussl R., Logher R., 2010, *Emerging Art Markets*, „Emerging Markets Review", vol. 11(4).
Lucinska A., 2015, *The Art Market in The European union*, „International Advances in Economic Research", vol. 21.
Mandel B., 2009, *Art As An Investment And Conspicuous Consumption Good*, „American Economic Review", vol. 99(4).
Mei J., Moses M., 2002, *Art As An Investment An The Underperformance Of Masterpieces*, „American Economic Review", vol. 92.
Renneboog L., Spaenjers C., 2013, *Buying Beauty: On Prices And Returns In The Art Market*, „Management Science", vol. 59.
Renneboog L., Van Houtte T., 1999, *The Monetary Appreciation Of Paintings: From Realism To Magritte*, „Cambridge Journal of Economics", vol. 26.
Taylor D., Coleman L., 2011, *Price Determinants Of Aboriginal Art, And Its Role As An Alternative Asset Class*, „Journal of Banking and Finance", vol. 35.
Worthington A., Higgs H., 2003, *Art as an Investment: Short and Long-Term Comovements in Major Paintings Markets*, „Empirical Economics", vol. 28.
Worthington A., Higgs H., 2004, *Art as an Investment: Risk, Return and Portfolio Diversification in Major Painting Markets*, „Accounting and Finance", vol. 44.
[www1] www.artprice.com/catalogues/info [access 7.11.2019].
[www2] www.artpressagency.wordpress.com/category/stock-market/ [access 7.11.2019].

Appendix

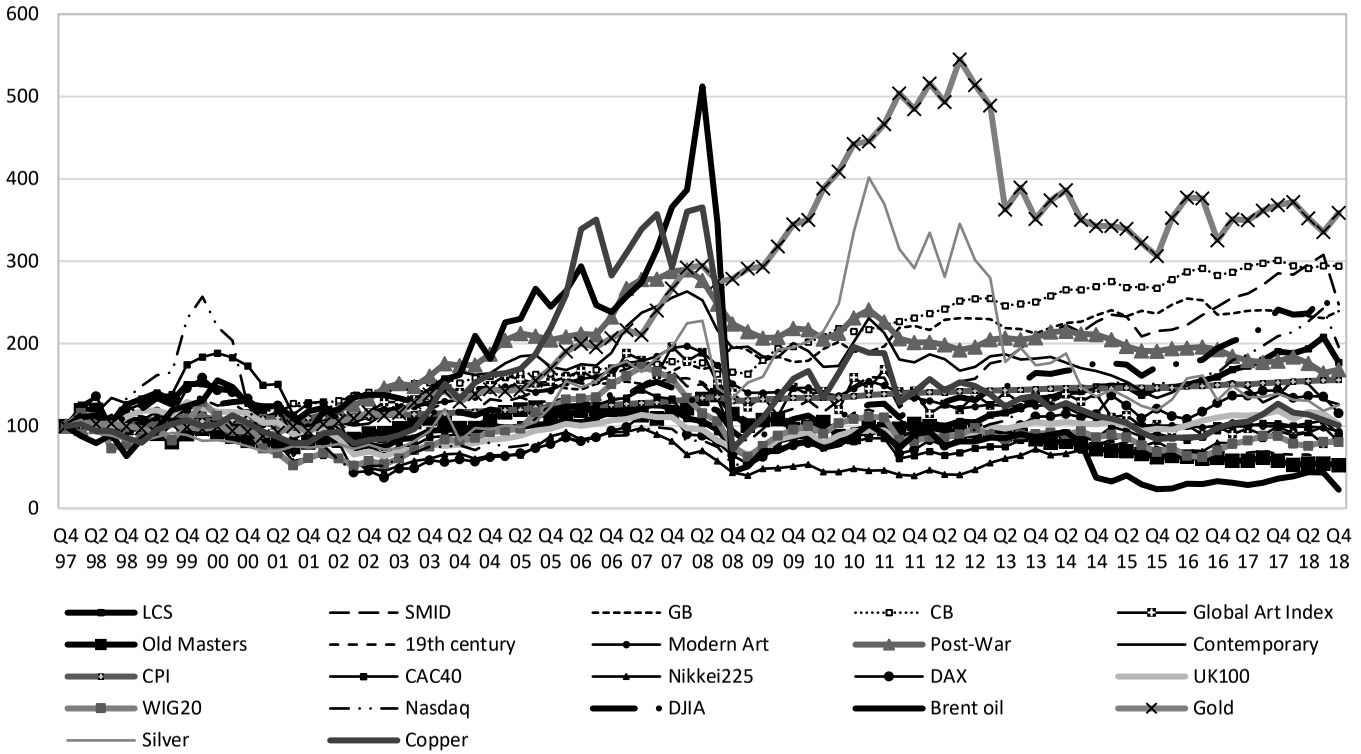

Chart 5. Performance of individual financial instruments and indexes in the analyzed period (Q4 1997–Q4 2018)

Source: own calculations.

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EFFECT OF CAPITAL CONVERSION IN THE FORM OF A REVERSE MORTGAGE ON BENEFITS FOR SENIOR CITIZENS IN MAJOR CITIES OF POLAND

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Abstract

The aging of population is a common problem in the modern economy and finance. Reverse mortgage is one of alternative ways of raising citizens' standard of living after retiring by obtaining financial benefits accumulated in a residential property. The aim of the study is to evaluate a role of *equity release* service in providing additional household income for senior citizens illustrated by the case of a reverse mortgage. This type of service consists in transformation of non-liquid, tied-up in property capital into liquid financial resources. Thanks to capital conversion, senior citizens can supplement retirement benefits without a need to leave their property. The research hypothesis verified in the study stated that benefits paid as *equity release* in the form of a reverse mortgage provided greater support for women than for men. That hypothesis was rejected.

Keywords: household, aging, *equity release,* reverse mortgage.

JEL Class: J14, G22.

INTRODUCTION

Taking into consideration the common occurrence of population aging processes, one of the interesting, current and worth mentioning ways of alternative forms of raising a standard of living after retiring, is by obtaining financial resources accumulated in a residential property. The problem discussed in the paper that concerns a problem of aging is of crucial theoretical importance in terms of economy or finance as a scientific discipline. It is also practical for potential clients taking advantage of this type of service. In view of the abovementioned issues, the main objective of the study was to evaluate a role of *equity release* service in supplementing household income of senior citizens. This type of service will be a potential reverse mortgage. It results in transformation of non-liquid, tied-up in property capital into liquid financial resources. Thanks to capital conversion, senior citizens can supplement retirement benefits without a need to leave their property [Tse 1995: 79; Huan and Mahoney 2002: 29]. As an example, the authors made an attempt to evaluate a value of ten-year benefits from a reverse mortgage that retired senior citizens could obtain in the major cities of Poland (Warsaw, Cracow, Gdansk, Poznan, Wroclaw, Lodz) if banks decided to introduce such a product to their range of products. Due to a limited scope of the paper, the study concerns only one ten-year period. The hypothesis that was subject to empirical verification stated that potential benefits paid in a form of *equity release* as a reverse mortgage, provide greater support for women than for men.

1. AGING OF THE POPULATION VERSUS THE PENSION GAP

The main challenge of the 21st century is to face a problem of population aging. Population aging (also called demographic aging) is manifested by an increasing share of senior citizens in a specific population [Bloom et al. 2015: 649]. It is a phenomenon that is observed when transformation from lavish (a high level of births and deaths) to modern (a low ratio of births and deaths) population reproduction [Okólski 2003: 154]. Such a situation was observed in the European countries in the 19th century when changes in population structure appeared, and at the same time, socio-economic transformations concerning industrialization and urbanization took place. About one hundred years were needed to let this phenomenon spread all over Europe. Intensification of the process of population aging connected with the second demographic transformation started in the 1960s. It was linked with changes in attitudes and systems of values of young people i.e. a limited role of marriage, increasing age of starting relationships and having children. These types of demographic

behavior patterns at the end of the century were observed all over Europe [*Prognoza ludności*…, 2014: 125].

Demographic causes of population aging can primarily include [Szatur-Jaworska et al. 2006: 223–223; Sanderson and Scherbov 2005: 811–813]:

- a fall in a number of births (as a result of which a percentage of younger population is falling),
- a fall in a number of deaths (especially in younger age groups),
- increased life expectancy (as a result, an increase in an absolute number of older people),
- migration processes.

The primary measure of advancement level of population aging processes is an old-age rate [Zeug-Żebro 2015: 59–72], i.e. the proportion of people at the age of 65 and older in the total population. According to the UN classification from 1956, an individual population exceeds the threshold of demographic old age if a proportion of people at the age of at least 65 in the total population exceeds 7% [*World Population Prospects*…, 2005]. Taking into consideration the fact that from the moment of preparing that scale, a significant improvement in the population's standard of living and health, whose effect is increased life expectancy, has been observed, this threshold of demographic old age has become outdated and ceased to be appropriate for contemporary societies [Klonowicz 1979: 64–65]. In the following elaboration we will focus more on the dynamics of changes in an old-age rate i.e. the mere fact of progressive aging of the population of Poland than on the determination of the stage of demographic old age that our society experiences.

Classic measures of population aging can additionally include other measures such as a median age, dependency ratio (e.g. a number of people at post-working age per 100 people at working age) and support ratios (e.g. a number of people between 15–64 per 100 people at the age of 65 and older) [Abramowska-Kmon 2011: 8].

While analyzing the process of population aging, the rates taken into account often include a rate of population growth (percentage change of population size compared to the previous year), average life expectancy and ratios of demographic dynamics (relationship between a number of births and deaths), fertility (an average number of children per one woman at reproductive age i.e. between 15–49) and gross reproduction rate (a number of born girls per one woman of child-bearing potential).

The description of this situation in terms of selected changes in the population structure and movements in Poland over the years is presented in Table 1.

Table 1. Evolution of aging processes of Polish society

Years		1950	1960	1970	1980	1990	2000	2010	2015	2016
Rate of population growth (%)		1,7	1,1	0,8	0,9	0,2	–0,0	0,1	–0,1	–0,0
Median age	males	24,4	25,1	26,2	28,4	30,9	33,4	36,3	38,2	38,6
	females	27,1	28,3	30,3	31,0	33,7	37,4	39,9	41,6	41,9
Average life expectancy	males	56,1	64,9	66,6	66,0	66,2	69,7	72,1	73,6	73,9
	females	61,7	70,6	73,3	74,4	75,2	78,0	80,6	81,6	81,9
Population age	65 and older in total %	5,3	5,9	8,4	10,0	10,2	12,4	13,5	15,8	16,4
	post-working per 100 people at working age	12	15	19	20	22	24	26	31	33
Rate	demographic dynamics	2,643	2,986	2,039	1,970	1,403	1,028	1,092	0,935	0,985
	fertility	3,705	2,980	2,200	2,276	1,991	1,367	1,376	1,289	1,357
	gross reproduction	1,790	1,438	1,064	1,108	0,968	0,663	0,662	0,627	0,660

Source: *Rocznik demograficzny 2017*, 2017: 58–61; *Trwanie życia w 2016 r.*, 2017: 16–17 (tab. 1).

Based on the information presented in Table 1, it can be stated that aging processes of the population of Poland in the period between 1950–2016 evolved. It is reflected, interalia, by:

– a falling rate of population growth, from 1.7% in 1950 to a minus close to 0 value in 2016,

– a growing median age of population, from 24.4 for men and 27.1 for women in 1950 to 38.6 for men and 41.9 for women in 2016,

– increased average life expectancy, from 56.1 for men and 61.7 for women in 1950 to 73.9 for men and 81.9 for women in 2016,

– a growing proportion of people at 65 and older in the whole population from 5.3% in 1950 to 16.4% in 2016,

– a growing number of people at post-working age (65+ for men and 60+ for women) per 100 people at working age (18–64 for men and 18–59 for women) i.e. growth in dependency ratio with people at post-working age from 12 in 1950 to 33 in 2016,

– a falling ratio of demographic dynamics from 2.643 in 1950 to 0.985 in 2016,

– a falling fertility ratio from 3.705 in 1950 to 1.357 in 2016 (i.e. below a value of 2.1 that ensures generation replacement),

– a falling gross reproduction rate from 1.790 in 1950 to 0.660 in 2016.

According to the demographic forecast of the Central Statistical Office from 2014 comprising the period to 2050, the Polish society will still experience aging processes. Its manifestation is a predicted growing old-age rate. In 2020, 2035 and 2050 it is expected to respectively amount to 18.9%, 24.5% and 32.7% [*Prognoza ludności…*, 2014: 134 (tab. 24)]. The median age will also increase and is respectively expected in the abovementioned periods to amount to 40.3, 46.7, 50.1 for men and respectively 43.6, 50.4 and 54.8 for women [*Prognoza ludności…*, 2014: 127 (tab. 21)]. In spite of the fact that Poland is still considered in Europe a relatively young demographic nation, it is expected that in 2050 it will be one of the European countries of the most advanced degree of population aging [*Prognoza ludności…*, 2014: 165]. It is important to bear in mind that such factors as increased life expectancy and improvement of health condition should influence delayed aging symptoms i.e. moving an old-age threshold and at the same time, eliminate an actual degree of demographic old-age advancement.

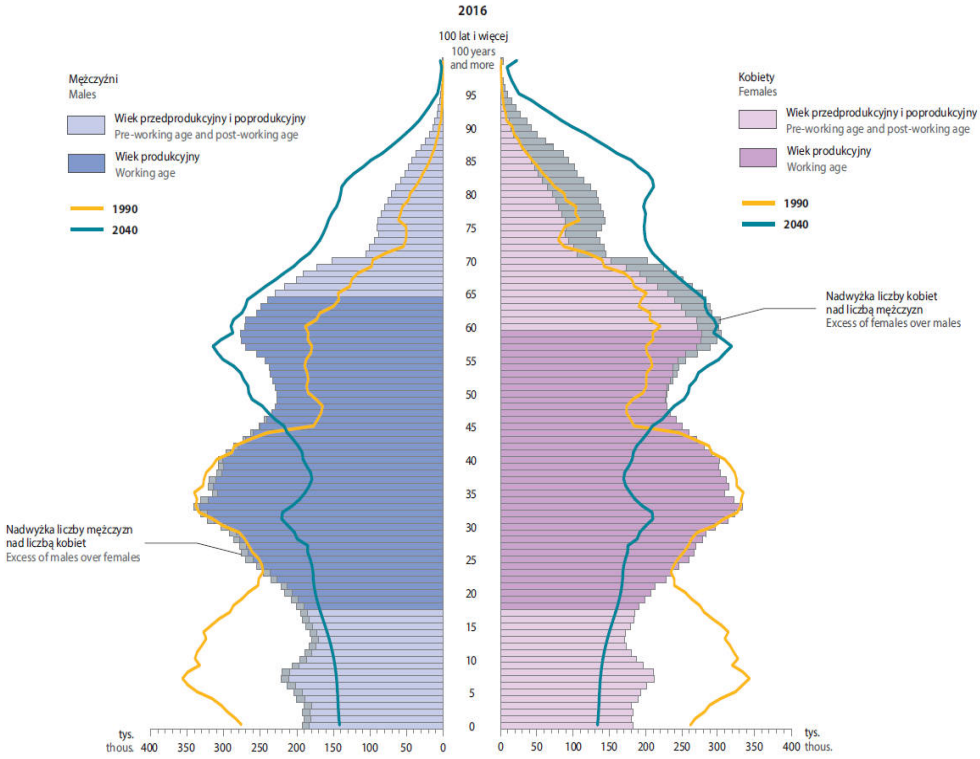

Figure 1. Structure of the population of Poland by gender and age in 1990, 2016 and 2040

Source: *Atlas demograficzny Polski*, 2017: 12.

The analysis of demographic aging can be conducted while examining changes in the population structure by gender and age. The tool that can be helpful here is the so-called age pyramid. Let us take a look for illustrative purposes at the age pyramid prepared for the population of Poland for 1990, 2016 and forecast for 2040.

As can be seen from the information presented in Figure 1, over the years the base of the age pyramid gets increasingly narrow. This phenomenon is called the aging from the bottom of the age pyramid". It is an effect of reduced fertility that is weakened by a decrease in mortality in the first years of life. Additionally, the „swelling" of the top of the pyramid is observed, which is a sign of „from the top of the age pyramid" aging and is connected with limited adult mortality who live up to increasingly advanced age. What is worth noting here is that a successive increase in a number of the oldest people in the society is observed i.e. at ripe old age (90 and older), women in particular. Due to that fact while analyzing and measuring population aging, a ratio indicating a proportion of the oldest people in the population at the age of above 65 was used.

One of the consequences of progressive population aging [Jóźwiak and Kotowska 2010: 40–55] is a pension gap i.e. a situation when gross replacement rate that is a percentage relation of the first pension to the last gross renumeration, reaches a value of below 60% [Jedynak 2017: 97–99]. The European Commission estimated that in 2013 in the EU countries, an average gross replacement rate in public pension systems amounted to 42.5% (for Poland 53%), which already meant a few percent pension gap. In the future, the situation will be even worse in this respect. According to the European Commission's forecast the analogical value in 2050 will amount to 36.4% (for Poland 31.2%) [European Commission, *The 2015*…: 255 (tab. III.182)]. It means that older people who do not accumulate sufficient funds during their professional activity to secure a certain standard of living after retiring will be threatened with poverty. One of the solutions of this problem can be *equity release* products such as a reverse mortgage that was regulated by the act of October 23, 2014 on reverse mortgage [Kowalczyk-Rólczyńska 2014: 398–410; Kuchciak 2010a: 297–309] adopted by the Polish parliament. However, still[1] no bank has introduced a reverse mortgage to their product offer [Kuchciak 2010b: 81–96]. Due to that fact it is very difficult to assess a potential of this product in the Polish market, in the context of actual supplementation of pension system. Yet, it is possible to conduct a simulation of estimated values of benefits from a reverse mortgage that retired senior citizens could obtain if banks in Poland decided to add such a product to their offer. The abovementioned objective was achieved in a form of the study described in the subsequent part of the paper.

[1] As at 31 December, 2019.

2. ESTIMATED BENEFITS OBTAINED FROM REVERSE MORTGAGE

2.1. Description of the study

The study concerns the calculation of estimated ten-year benefits from a reverse mortgage that retired citizens [Kowalczyk-Rólczyńska 2015] could obtain if banks in Poland decided to introduce that product to their offer. These calculations were conducted separately for men and women signing such an agreement at the age between 65 to 75, who own a residential property of 30 to 70 square meters in one of the following cities: Warsaw, Cracow, Gdansk, Poznan, Wroclaw and Lodz. Adopting such data enables to precisely compare amounts of benefits, both in terms of age and gender of beneficiaries as well as the value of property.

In order to calculate estimated payments from a reverse mortgage, an account of terminated allowance was used, in particular aided with the following formula [Wieteska 2011: 260–261; Kellison 2009: 80]:

$$R = \frac{\alpha \cdot W_r}{\left[\frac{N_x - N_{x+n}}{D_x}\right]}$$

where:
R – amount of annual benefit paid at the beginning of every year,
$\alpha \cdot W_r$ – amount of granted reverse mortgage that is a part of market value of property at the time of signing the agreement,
$D_x = v^x l_x$ – discounted number of people that reached the age of x,
$N_x = \sum_{t=0}^{\infty} D_{x+t}$ (in practice the aggregation does not go to infinity but to a maximum age included in life expectancy tables [Zgliczyńska 2014: 243]).

Based on the data presented in the literature as α the value of 30% was adopted. A relatively low level of α results from the fact that banks, apart from calculated interest and other costs, would have to take into consideration the fact that a dramatic drop in property value, serving as collateral may occur [Meluch 2017: 7; Czech 2015: 96]. The calculations were based on a discount rate of 2.87%, announced in January 2019 [www1, access 18.04.2019].

In order to make estimations, the Life Expectancy Tables of Poland for 2017, published by the Central Statistical Office (GUS) were used. Based on the estimations for an average life expectancy, it was assumed that the calculations of payments for harmonization will be conducted for the period of ten years for all age groups.

While estimating the authors also used the data from transaction price bases of residential properties on the secondary market in selected cities in the fourth quarter of 2018, prepared in the NBP Department of Economic Analyses. On this basis, average transaction prices of residential properties were calculated, depending on a location and property area. The results are presented in Table 2.

Table 2. Average transaction prices of residential properties in selected cities in Poland in the fourth quarter in 2018

Cities	Average transaction price for one square meter (in PLN)	Average transaction price of residential properties (in PLN)				
		30 m^2	40 m^2	50 m^2	60 m^2	70 m^2
Warsaw	8 259	247 770	330 360	412 950	495 540	578 130
Cracow	6 849	205 470	273 960	342 450	410 940	479 430
Gdansk	7 499	224 970	299 960	374 950	449 940	524 930
Poznan	5 937	178 110	237 480	296 850	356 220	415 590
Wroclaw	6 191	185 730	247 640	309 550	371 460	433 370
Lodz	4 465	133 950	178 600	223 250	267 900	312 550

Source: own study based on *Baza cen nieruchomości*…, access 18.04.2019.

2.2. Presentation of results and their interpretation

In all calculations below, no potential periodical, additional costs charged by banks, insurance costs or valorization of paid benefits were taken into account. The results are expressed with an accuracy of one.

2.2.1. Potential benefits from a reverse mortgage for senior citizens from Warsaw

In case of ten-year period of payments a 65-year-old woman from Warsaw may count on additional amount of between PLN 742–1 730 a month depending on a flat area, whereas a 65-year-old man from Warsaw can expect between PLN 791–1 846 a month. To compare, a 75-year-old woman can obtain additional PLN 809–1 887 a month i.e. by PLN 67–157 more than a 65-year-old woman, whereas a 75-year-old man can obtain PLN 898–2 095 a month i.e. by PLN 107–249 more than a 65-year-old man.

Detailed results concerning monthly ten-year benefits paid from a reverse mortgage to senior citizens who own a residential property in Warsaw are shown in Table 3.

Table 3. Monthly amounts of ten-year benefits from a reverse mortgage for senior citizens from Warsaw by age, gender and flat area

Age	Amounts of monthly benefits for senior citizens from Warsaw (in PLN) – 10 years									
	30 m^2		40 m^2		50 m^2		60 m^2		70 m^2	
	F	M	F	M	F	M	F	M	F	M
65	742	791	989	1 055	1 236	1 318	1 483	1 582	1 730	1 846
66	745	797	994	1 063	1 242	1 329	1 490	1 595	1 739	1 861
67	749	804	999	1 073	1 248	1 341	1 498	1 609	1 748	1 877
68	753	812	1 005	1 083	1 256	1 353	1 507	1 624	1 758	1 895
69	758	820	1 011	1 094	1 264	1 367	1 516	1 641	1 769	1 914
70	764	830	1 018	1 106	1 273	1 383	1 528	1 659	1 782	1 936
71	770	840	1 027	1 120	1 284	1 400	1 540	1 681	1 797	1 961
72	778	852	1 037	1 136	1 296	1 420	1 555	1 704	1 814	1 988
73	786	866	1 048	1 154	1 311	1 443	1 573	1 731	1 835	2 020
74	797	881	1 062	1 174	1 328	1 468	1 593	1 761	1 859	2 055
75	809	898	1 078	1 197	1 348	1 496	1 617	1 796	1 887	2 095

Source: own study based on *Baza cen nieruchomości*…, access 18.04.2019.

2.2.2. Potential benefits from a reverse mortgage from senior citizens from Cracow

In case of ten-year period of payments a 65-year-old woman from Cracow may count on an additional amount of between PLN 615–1435 a month, depending on a flat area, whereas a 65-year-old man from Cracow can expect between PLN 656–1 531 a month. To compare, a 75-year-old woman can obtain additional PLN 671–1 565 a month, i.e. by PLN 56–130 more than a 65-year-old woman, whereas a 75-year-old man can obtain PLN 745–1737 a month, i.e. by PLN 89–206 than a 65-year-old man.

Detailed results concerning monthly ten-year benefits paid to senior citizens who own a residential property in Cracow from a reverse mortgage are shown in Table 4.

Table 4. Monthly amounts of ten-year benefits from a reverse mortgage for senior citizens from Cracow by age, gender and flat area

Age	Amounts of monthly benefits for senior citizens from Cracow (in PLN)									
	30 m^2		40 m^2		50 m^2		60 m^2		70 m^2	
	F	M	F	M	F	M	F	M	F	M
65	615	656	820	875	1 025	1 093	1 230	1 312	1 435	1 531
66	618	661	824	882	1 030	1 102	1 236	1 323	1 442	1 543
67	621	667	828	889	1 035	1 112	1 242	1 334	1 449	1 556
68	625	673	833	898	1 041	1 122	1 250	1 347	1 458	1 571
69	629	680	838	907	1 048	1 134	1 258	1 361	1 467	1 587
70	633	688	844	917	1 056	1 147	1 267	1 376	1 478	1 606
71	639	697	852	929	1 064	1 161	1 277	1 394	1 490	1 626
72	645	707	860	942	1 075	1 178	1 290	1 413	1 505	1 649
73	652	718	869	957	1 087	1 196	1 304	1 436	1 522	1 675
74	661	730	881	974	1 101	1 217	1 321	1 461	1 542	1 704
75	671	745	894	993	1 118	1 241	1 341	1 489	1 565	1 737

Source: own study based on *Baza cen nieruchomości*…, access 18.04.2019.

2.2.3. Potential benefits from a reverse mortgage from senior citizens from Gdansk

In case of ten-year period of payments, a 65-year-old woman from Gdansk may count on an additional amount of between PLN 673–1 571 a month, depending on a flat area, whereas a 65-year-old man from Gdansk can expect between PLN 718–1 676 a month. To compare, a 75-year-old woman can obtain additional PLN 734–1 713 a month, i.e. by PLN 61–142 more than a 65-year-old woman, whereas a 75-year-old man can obtain PLN 815–1 902 a month, i.e. by PLN 97–226 than a 65-year-old man.

Detailed results concerning monthly ten-year benefits paid to senior citizens who own a residential property in Gdansk from a reverse mortgage are shown in Table 5.

Table 5. Monthly amounts of ten-year benefits from a reverse mortgage for senior citizens from Gdansk by age, gender and flat area

Age	Amounts of monthly benefits for senior citizens from Gdansk (in PLN)									
	30 m^2		40 m^2		50 m^2		60 m^2		70 m^2	
	F	M	F	M	F	M	F	M	F	M
65	673	718	898	958	1 122	1 197	1 347	1 436	1 571	1 676
66	677	724	902	965	1 128	1 207	1 353	1 448	1 579	1 689
67	680	730	907	974	1 134	1 217	1 360	1 461	1 587	1 704
68	684	737	912	983	1 140	1 229	1 368	1 475	1 596	1 720
69	688	745	918	993	1 147	1 241	1 377	1 490	1 606	1 738
70	693	753	925	1 005	1 156	1 256	1 387	1 507	1 618	1 758
71	699	763	932	1 017	1 165	1 272	1 399	1 526	1 632	1 780
72	706	774	941	1 032	1 177	1 290	1 412	1 547	1 647	1 805
73	714	786	952	1 048	1 190	1310	1 428	1 572	1 666	1 834
74	723	800	964	1 066	1 206	1 333	1 447	1 599	1 688	1 866
75	734	815	979	1 087	1 224	1 359	1 469	1 630	1 713	1 902

Source: own study based on *Baza cen nieruchomości*…, access 18.04.2019.

2.2.4. Potential benefits from reverse mortgage from senior citizens from Poznan

In case of ten-year period of payments, a 65-year-old woman from Poznan may count on additional amount of between PLN 533–1 244 a month, depending on a flat area, whereas a 65-year-old man from Poznan can expect between PLN 569–1 327 a month. To compare, a 75-year-old woman can obtain additional PLN 581–1 357 a month, i.e. by PLN 48–113 more than a 65-year-old woman, whereas a 75-year-old man can obtain PLN 645–1 506 a month, i.e. by PLN 76–179 more than a 65-year-old man.

Detailed results concerning monthly ten-year benefits paid to senior citizens who own a residential property in Poznan from a reverse mortgage are shown in Table 6.

Table 6. Monthly amounts of ten-year benefits from a reverse mortgage for senior citizens from Poznan by age, gender and flat area

Age	Amounts of monthly benefits for senior citizens from Poznan (in PLN)									
	30 m^2		40 m^2		50 m^2		60 m^2		70 m^2	
	F	M	F	M	F	M	F	M	F	M
65	533	569	711	758	888	948	1 066	1 137	1 244	1 327
66	536	573	714	764	893	955	1 071	1 146	1 250	1 338
67	538	578	718	771	897	964	1 077	1 156	1 256	1 349
68	542	584	722	778	903	973	1 083	1 167	1 264	1 362
69	545	590	727	786	908	983	1 090	1 179	1 272	1 376
70	549	596	732	795	915	994	1 098	1 193	1 281	1 392
71	554	604	738	805	923	1 007	1 107	1 208	1 292	1 409
72	559	613	745	817	932	1 021	1 118	1 225	1 304	1 429
73	565	622	754	830	942	1 037	1 131	1 244	1 319	1 452
74	573	633	764	844	954	1 055	1 145	1 266	1 336	1 477
75	581	645	775	860	969	1 076	1 163	1 291	1 357	1 506

Source: own study based on *Baza cen nieruchomości*…, access 18.04.2019.

2.2.5. Potential benefits from a reverse mortgage from senior citizens from Wroclaw

In case of ten-year period of payments a 65-year-old woman from Wroclaw may count on additional amount of between PLN 556–1 297 a month, depending on a flat area, whereas a 65-year-old man from Wroclaw can expect between PLN 593–1 383 a month. To compare, a 75-year-old woman can obtain additional PLN 606–1 415 a month, i.e. by PLN 50–118 more than a 65-year-old woman, whereas a 75-year-old man can obtain PLN 673–1 570 a month, i.e. by PLN 80–187 more than a 65-year-old man.

Detailed results concerning monthly ten-year benefits paid to senior citizens who own a residential property in Wroclaw from a reverse mortgage are shown in Table 7.

Table 7. Monthly amounts of ten-year benefits from a reverse mortgage for senior citizens from Wroclaw by age, gender and flat area

Age	Amounts of monthly benefits for senior citizens from Wroclaw (in PLN)									
	30 m^2		40 m^2		50 m^2		60 m^2		70 m^2	
	F	M	F	M	F	M	F	M	F	M
65	556	593	741	791	927	988	1 112	1 186	1 297	1 383
66	559	598	745	797	931	996	1 117	1 196	1 303	1 395
67	562	603	749	804	936	1 005	1 123	1 206	1 310	1 407
68	565	609	753	812	941	1 014	1 129	1 217	1 318	1 420
69	568	615	758	820	947	1 025	1 137	1 230	1 326	1 435
70	573	622	763	829	954	1 037	1 145	1 244	1 336	1 451
71	577	630	770	840	962	1 050	1 155	1 260	1 347	1 470
72	583	639	777	852	971	1 065	1 166	1 278	1 360	1 490
73	589	649	786	865	982	1 081	1 179	1 298	1 375	1 514
74	597	660	796	880	995	1 100	1 194	1 320	1 393	1 540
75	606	673	808	897	1 010	1 122	1 212	1 346	1 415	1 570

Source: own study based on *Baza cen nieruchomości*…, access 18.04.2019.

2.2.6. Potential benefits from reverse mortgage from senior citizens from Lodz

In case of ten-year period of payments, a 65-year-old woman from Lodz may count on additional amount of between PLN 401–935 a month, depending on a flat area, whereas a 65-year-old man from Lodz can expect between PLN 428–998 a month. To compare, a 75-year-old woman can obtain additional PLN 437–1 020 a month, i.e. by PLN 36–85 more than a 65-year-old woman, whereas a 75-year-old man can obtain PLN 485–1 133 a month, i.e. by PLN 57–135 more than a 65-year-old man.

Detailed results concerning monthly ten-year benefits paid to senior citizens who own a residential property in Lodz from reverse mortgage are shown in Table 8.

Table 8. Monthly amounts of ten-year benefits from a reverse mortgage for senior citizens from Lodz by age, gender and flat area

Age	Amounts of monthly benefits for senior citizens from Lodz (in PLN)									
	30 m^2		40 m^2		50 m^2		60 m^2		70 m^2	
	F	M	F	M	F	M	F	M	F	M
65	401	428	535	570	668	713	802	855	935	998
66	403	431	537	575	671	719	806	862	940	1 006
67	405	435	540	580	675	725	810	870	945	1 015
68	407	439	543	585	679	732	815	878	950	1 024
69	410	444	547	591	683	739	820	887	956	1 035
70	413	449	551	598	688	748	826	897	963	1 047
71	416	454	555	606	694	757	833	909	972	1 060
72	420	461	561	614	701	768	841	921	981	1 075
73	425	468	567	624	709	780	850	936	992	1 092
74	431	476	574	635	718	794	861	952	1 005	1 111
75	437	485	583	647	729	809	874	971	1 020	1 133

Source: own study based on *Baza cen nieruchomości*…, access 18.04.2019.

CONCLUSION

It must be stated that *equity release* may play a significant role in providing benefits for senior citizens from their properties. Depending on specificity and various conditions, there may be a variety of obtained benefits. The results of conducted research show that the highest payments can be expected by the residents of Warsaw and the lowest by Lodz residents. It is connected with the fact that property prices are the highest in Warsaw and in Lodz – the lowest, and a value of property significantly affects an amount of obtained payments.

Apart from a property value, amounts of benefits depend on a gender and age of a property owner who concludes a reverse mortgage agreement. Taking that into consideration, the highest benefits could be offered to men who at the moment of joining the program are at the age of 75. It is related to the fact that average life expectancy for this group is the lowest (women of the same age generally live longer than men) and theoretically, a bank could get their money back faster. What is worth noting here is the fact that the higher beneficiary's age,

the bigger difference in amounts of paid benefits between women and men. It must be also mentioned that similar amounts of benefits could be granted to a 66-year-old man and a 74-year-old woman.

Conducted calculations lead to the conclusion that benefits from a reverse mortgage would definitely increase senior citizens' income. For a 10-year period of paid benefits, income for men would monthly increase on average by between PLN 428 to 2 095, whereas benefits for women between PLN 401 to 1 887. However, it must be kept in mind that benefits from a reverse mortgage are generally not life annuities, so a potential growth in seniors' budget would be only periodical. In the course of the studies the authors made a falsification of the hypothesis assumed initially which stated that higher benefits are paid to women than men. Such a state of affairs results mainly from a longer potential life expectancy for women.

Let us note that an overall amount of payment from a reverse mortgage does not exceed 37% of initial property value regardless of an owner's age and gender. On the one hand, such a situation might cause seniors' disappointment that the amount of a reverse mortgage is only 1/3 of initial property value. On the other hand, it must be noted that after an owner's death, potential heirs would be obliged to pay back accumulated debt if they wished to keep the property (the bank under no condition earns on increases in property prices or the beneficiary's premature death).

BIBLIOGRAPHY

Abramowska-Kmon A., 2011, *O nowych miarach zaawansowania procesu starzenia się ludności*, „Studia Demograficzne", no. 1(159).

Atlas demograficzny Polski, 2017, GUS, Warszawa.

Baza cen nieruchomości mieszkaniowych BaRN, Departament Analiz Ekonomicznych, https://www.nbp.pl/publikacje/rynek_nieruchomosci/ceny_mieszkan.xls?v=2018q2 [access 18.04.2019].

Bloom D.E., Chatterji S., Kowal P., Lloyd-Sherlock P., McKee M., Rechel B., Rosenberg L., Smith J.P., 2015, *Macroeconomic implications of population ageing and selected policy responses*, „The Lancet", vol. 385, issue 9968.

Czech T., 2015, *Odwrócony kredyt hipoteczny. Komentarz*, LEX a Wolters Kluwer Business, Warszawa.

European Commission, *The 2015 Ageing Report. Economic and budgetary projections for the 28 EU Member States (2013–2060)*, „European Economy", no. 3.

Huan C., Mahoney J., 2002, *Equity release mortgages*, „Housing Finance International", vol. 16, no. 4.

Jedynak T., 2017, *The Role of Supplementary Retirement Savings in Reducing the Pension Gap in Poland*, „Economic and Environmental Studies", vol. 17, no. 41.

Jóźwiak J., Kotowska I.E., 2010, *Przewidywane zmiany liczby i struktury wieku ludności w Polsce do 2035 r. i ich skutki ekonomiczne*, [in:] *Problemy demograficzne Polski i ich skutki ekonomiczne, Raport z pierwszego posiedzenia Narodowej Rady Rozwoju*, Warszawa.

Kellison S.G., 2009, *The Theory of Interest*, McGraw-Hill, New York.
Klonowicz S., 1979, *Oblicza starości. Wybrane zagadnienia gerontologii społecznej*, Wiedza Powszechna, Warszawa.
Kowalczyk-Rólczyńska P., 2014, *Adekwatność ochrony ubezpieczeniowej w ubezpieczeniach na życie powiązanych z kredytami hipotecznymi*, [in:] J. Czekaj, E. Miklaszewska, W. Sułkowska (eds.), *Rynek finansowy jako mechanizm alokacji zasobów w gospodarce*, Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie, Kraków.
Kowalczyk-Rólczyńska P., 2015, *Rola odwróconego kredytu hipotecznego w zabezpieczeniu emerytalnym*, „Praca i Zabezpieczenie Społeczne", no. 8.
Kuchciak I., 2010a, *Odwrócona hipoteka jako odpowiedź sektora bankowego na trendy demograficzne*, „Annales Universitatis Mariae Curie-Skłodowska", Sectio H. Oeconomia, vol. 44, no. 2.
Kuchciak I., 2010b, *Odwrócona hipoteka nowym produktem w ofercie bankowości detalicznej*, „Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu. Bankowość detaliczna: idee – modele – procesy", no. 124.
Meluch B., 2017, *Odwrócona hipoteka – model kredytowy czy model sprzedażowy? Czy polski senior będzie mógł wzmocnić swój budżet?*, [in:] E. Rutkowska-Tomaszewska (ed.), *„Odwrócona hipoteka" jako nowa usługa na rynku finansowym*, C.H. Beck, Warszawa.
Okólski M., 2003, *Demografia. Podstawowe pojęcia, procesy i teorie encyklopedyczne w zarysie*, Scholar, Warszawa.
Prognoza ludności na lata 2014–2050, 2014, GUS, Warszawa.
Rocznik demograficzny 2017, 2017, GUS, Warszawa.
Sanderson W., Scherbov S., 2005, *Average Remaining Lifetimes Can Increase As Human Populations Age*, „Nature", no. 435.
Szatur-Jaworska B., Błędowski P., Dzięgielewska M., 2006, *Podstawy gerontologii społecznej*, Aspra-jr, Warszawa.
Trwanie życia w 2016 r., 2017, GUS, Warszawa.
Trwanie życia w 2017 r., 2018, GUS, Warszawa.
Tse Y.K., 1995, *Modeling reverse mortgages*, „Asia Pacific Journal of Managment", vol. 12, no. 2.
Wieteska S., 2011, *Zastosowanie rachunku życiowych do kalkulacji świadczeń w hipotece odwróconej*, [in:] A.S. Barczak, S. Barczak (eds.), *Metody matematyczne, ekonometryczne i komputerowe w finansach i ubezpieczeniach 2009*, UE w Katowicach, Katowice.
World Population Prospects: The 2004 Revision, 2005, UN Department of Economic and Social Affairs Population Division, New York.
Zeug-Żebro K., 2015, *Wielowymiarowa analiza zjawiska starości w Polsce*, [in:] J. Mika, M. Miśkiewicz-Nawrocka (eds.), *Metody i modele analiz ilościowych w ekonomii i zarządzaniu*, cz. 7, Wydawnictwo UE w Katowicach, Katowice.
Zgliczyńska W., 2014, *Odwrócona hipoteka jako jedna z możliwości zwiększania przychodów emerytów*, „Zeszyty Naukowe Uniwersytetu Szczecińskiego. Współczesne Problemy Ekonomiczne. Globalizacja. Liberalizacja. Etyka", no. 9.
[www1] https://www.uokik.gov.pl/stopa_referencyjna_i_archiwum.php [access 18.04.2019].

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DEPOSIT GUARANTEE SYSTEMS IN RUSSIA AND THE USA

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Abstract

The purpose of the article/hypothesis: The purpose of the article is to indicate the results of operations of deposit guarantee systems in Russia and the USA. The research hypothesis was that the deposit guarantee system in Russia during the 2004–2018 research period was more heavily burdened with guarantee activities.
Methodology: The article is largely based on a review, analysis and synthesis of selected publications and available statistical data. Additionally, it is expanded by the authors' conclusions and the results of their research.
Results of the research: They clearly indicate a high burden on the institution guaranteeing deposits in Russia (DIS). This is primarily the result of actions aimed at stabilizing the Russian banking sector.

Keywords: deposit guarantees, deposit guarantee systems, Russia, USA.

JEL Class: G20, G21, N2.

INTRODUCTION

The financial sector plays an important role in the economy because provides financial intermediation, i.e. deals with the transfer of founds from savers to investors. At the same time, the importance of banking institutions has increased. The main activity of these institutions is the sale of financial products such as loans and deposits. Banks are a particularly important link in the financial system. Funds deposited with these institutions may be the basis for the creation of credit money. The bank, acting as an intermediary between borrowers and savers, accepts deposits from entities with financial surpluses and converts them into loans to entities with a financial shortage. There is a risk that if all depositors decide to withdraw their funds entrusted to the banks, they will not be able to meet their obligations and will be forced to liquidate their assets and thus declare bankruptcy. Therefore, an oversupply of credit, coupled with securitization, may form the basis of events leading to a financial crisis. The combination of the aforementioned factors may threaten the bank's insolvency and its bankruptcy [Semenova and Shapkin 2019: 2150–2155]. Moreover, there may be a contagion effect in which the closure of one bank causes panic in other banks, causing massive withdrawals of deposits from these institutions as well (a run on the bank) [Aharony and Swary 1983: 308–311]. In such situation, depositors may not receive funds entrusted to a given credit institution. This threat was revealed in particular during the financial crisis that emerged in 2007. Protection against this type of events is provided by deposit guarantee systems, which provide depositors with withdrawals of funds entrusted to the bank. They are a key element in maintaining confidence in the banking sector and ensuring financial stability. These systems operate in various forms and have many powers. Since the establishment of the first of them – the American Federal Deposit Insurance Corporation (FDIC) – one can observe the spread of deposit protection around the world. This issue creates an ever wider field of considerations, both theoretical and empirical.

1. THE GENESIS AND FUNCTIONING OF DEPOSIT GUARANTEE SYSTEMS

Deposit guarantee systems were established to protect funds deposited by customers in banks. This method of protecting funds was created as a result of crises on the financial market. Deposit protection brings two kinds of benefits [Li et al. 2019: 2499–2502]:

1. It reduces the uncertainty among banks customers who have entrusted their funds to a given bank;
2. It reduces the systemic risk in the market.

The idea of a deposit guarantee, although it has been in place for several decades, is quite new issue[1]. The first deposit guarantee system was established in the United States in 1933. The institution established under this system functions until today (2020). Further cases of the emergence of guarantee systems took place in Europe in highly developed countries. The 80s and 90s of the last century were a time when there was a big increase, and there was a „flood" of institutionalized deposit guarantee systems [Zdanowicz 2007: 14]. Initially, the countries set up their own institutions for guaranteeing deposits. The change took place in the 1980s, when work began on a common position of the European Union Member States on the subject of deposit guarantee systems [Baka 2005: 219].

The result of the aforementioned works was the Recommendation of the European Commission No. 87/63 / EEC issued in 1986. The Recommendation contains the most important elements of guaranteeing deposits in each Member State of the European Union. The legal act states that [Baka 2005]:

– The concept of deposit insurance should be synonymous with the protection of small depositors. Small depositors are people who are unable to determine the current situation and the correctness of the policy of the bank in which they deposit their funds.

– All banks should be obliged to participate in the deposit guarantee scheme. This should also include branches of foreign banks that operate in a given country.

– Deposit guarantee schemes can operate in private or public form. Both solutions were allowed due to differences between the banking sectors of the European Union Member States.

In 1998, the basic elements of deposit guarantee schemes were defined by the International Monetary Fund (IMF) [Zaleska 2007: 250–265]. As a result of the work of the IMF, standards for the functioning of deposit guarantees and their place in the financial sector and the economy were created.

The process of creating new guarantee funds and the convergence of the measures used, especially in Europe, was strengthened by the implementation of the European Parliament Directive, i.e. Directive 94/19/EC of the European Parliament and of the Council of 30 May 1994 on deposit guarantee schemes. This Directive has been replaced by Directive 2014/49 (DGSD), which is the legal basis for the recent actions of all deposit guarantee schemes in the EU. As a result of the above-mentioned changes, among others, the minimum guarantee levels were increased, where the transitional level was set at EUR 100,000 and is valid until today.

[1] Looking at the period of operation of general economic theories, or the history of central banks.

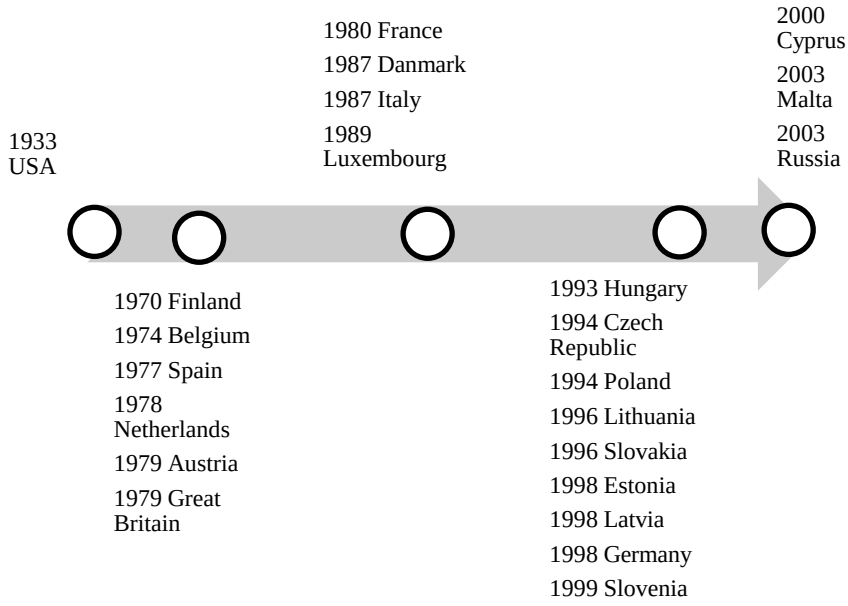


Figure 1. The history of the formation of deposit guarantee systems in Europe and the United States.

Source: own study based on: Baka 2005: 220; and websites of deposit guarantee systems of selected countries.

As can be seen from the presented illustration, the number of countries that have established deposit guarantee schemes has systematically increased. Moreover, according to the data of the International Association of Deposit Insurers (IADI[2]) as of July 2019, the number of countries in which any form of explicit deposit insurance was established increased to 145 from 12 countries in 1974 [www1, access 15.03.2020].

After the financial crisis (2007–2009), which highlighted the financial weakness of many banks (including wrong risk management practices, systemically risky interconnections, and lack of sufficient supervision), a number of regulatory reforms were undertaken to address these shortcomings and create a more resilient financial system [Cerrone 2018: 224–239]. A key element of the changes was reducing the likelihood of bank failures and solving the problem of „too big to fail". Supervision has been significantly strengthened by a set of

[2] The organization, established in 2002, brings together deposit insurers from all over the world in order to share knowledge and experience. From April 2020, the number of organizations belonging to this institution is 87.

uniform rules for the financial sector and their uniform application throughout the European Union.

Bank failures distort the allocation of capital and, in most cases, lead to falls in the real economy. One of the methods of prevention against the mass outflow of funds used by banking entities are deposit guarantees [Constantinescu 2015: 43–46]. People don't make withdrawals when they have confidence that their funds are safely insured [Rolnick 2010: 26–39]. If depositing with banks was generally considered risky, the ability of banks to perform their primary function of intermediation in the financial market would be limited. Hence, if the bank deposits can be fully guaranteed and the guarantee is reliable, then from the depositor's point of view, the funds entrusted by him are generally risk-free [Merton 1977: 3–11].

The deposit guarantee schemes mainly consist of guaranteeing deposits up to a certain predetermined value. The limits of the guaranteed funds are in many cases included in the legal act establishing the deposit guarantee institution. In practice, the most often there are limits on the value of guaranteed funds for one customer in a given bank. This means that the same client may also have guaranteed funds in another banking institution [Howarth and Quaglia 2018: 195–201].

Policymakers have a variety of options concerning the protection of depositors. Countries can make explicit the protection of depositors in the case of a bank failure or they can leave the level of protection ambiguous, allowing the level and coverage of depositor protection implicit. Informal systems, i.e. systems of the implicit type, are characterized by the fact that when a systemic threat occurs, public institutions will take ad hoc measures. This may cause some uncertainty among institutions taking deposits and depositors as to the safety of the funds entrusted. Conversely, explicit and formal Explicit Deposit Guarantee Schemes are widely recognized as one of the most important elements of a credible safety net of the financial system. Under the open deposit guarantee system, on the closing date of an insolvent bank, the deposit guarantee institution pays out funds to eligible depositors up to the applicable limits. In this way, depositors are protected from losing their deposits [Chan et al. 2018: 73]. It is important that, from the point of view of the proper functioning of the system, it is based on extensive knowledge of the scope of protection of the contributions. Only then can it fulfill its role and prevent panic in the market. As stated by A. Demirgüç-Kunt and co-authors, every country without a clearly presented and regulated system (explicit) then has a systemtype of implicite, which results from the experience of the problems of the banking sector [Demirgüç-Kunt et al. 2007: 160–175]. Currently, most countries have a formalized deposit guarantee system, with a significant majority of developed countries.

Four basic types of deposit guarantee institutions are listed below (in line with the literature on the subject). There are four basic types of deposit guarantee institutions. Individual types differ in the scope of competences of a given institution, its powers and the purpose of its operation. There are institutions operating on the basis of:

– *paybox* – the activities of the institution guaranteeing deposits are limited only to the payment of guaranteed deposits when the situation requires it [Pawlikowski 2004: 5–11];

– *paybox-plus* – the guaranteeing institution is entitled to disburse funds for guaranteed deposits and to restructure or orderly wind up banking institutions in difficulty [www2, access 22.04.2020];

– *risk minimizer* – the activities of the institution guaranteeing deposits include guarantee payments and taking actions to prevent bankruptcy of entities operating in a given banking sector - it is mainly related to granting financial aid [Pawlikowski 2004: 5–11];

– *loss minimiser* – the institution guaranteeing deposits is entitled to disbursements of guaranteed funds, to carry out assistance activities aimed at reducing the risk of bankruptcy of a given bank, recommendations and supervision of the implementation of a restructuring strategy for entities at risk and orderly liquidation of entities declared bankrupt [www3, access 22.04.2020].

The most frequently used institution is the one that operates on the paybox principle.

2. DEPOSIT GUARANTEE SYSTEMS IN THE COUNTRIES OF THE FORMER USSR

The history of the creation of deposit guarantee schemes shows that in market economy countries they were established earlier than in countries with a centrally planned economy. This regularity seems to be confirmed by the establishment of the first system in the USA in 1933. On the other hand, in Russia – the largest country created after the collapse of the socialist bloc, an institution guaranteeing deposits was established in 2003. Due to the specificity of countries with a centrally planned economy, an attempt was made to look closer on the functioning of the deposit guarantee systems in countries created after the collapse of the USSR (the countries which were separate socialist countries before the change of the political system, because most of them are members of the European Union and are covered by the Directive 2014/49 (DGSD).

In 1991, the social, economic and political structures of the Soviet Union began to disintegrate. Fifteen post-Soviet states gained independence and began to create their own institutional framework, including the domestic financial system. The frequent crises of the 1990s threatened the evolution of banking

systems in which customers could place their trust, especially in an age where no deposit guarantee scheme existed yet [Savchenko and Kovács 2017: 29–42]. In 1996, Belarus and Lithuania were the first to set up a deposit guarantee system. Since then, also other countries, following this trail, began to introduce the above-mentioned guarantee systems into their structures, as shown in the diagram below (Figure 2).

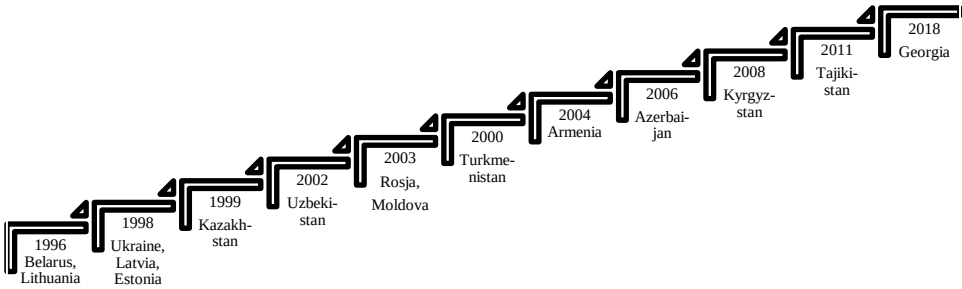


Figure 2. The history of the formation of deposit guarantee systems in post-Soviet countries.

Source: own study based on: Horsch et al. 2018: 27.

In line with the above timeline, deposit guarantee systems in the former Soviet Union countries were established in the period 1996–2018. The deposit guarantee systems in the former Soviet Union countries differ in form, the limit of guaranteed funds and the manner of their administration. The shape of the functioning of the contribution guarantee system in a given country depends on various factors. One of the dilemmas is the choice of establishing a separate fund or entrusting its powers to an already existing institution, usually the central bank. A comparative analysis of depository systems operating in the post-Soviet countries is presented in the table below (see Table 1).

Table 1 (part 1). Comparison of deposit guarantee systems in the post-Soviet countries

Category	Belarus	Lithuania	Ukraine	Latvia	Estonia	Kazakhstan	Turkmenistan	Uzbekistan
Entity responsible for deposit guarantees	Deposit Compensation Agency	State Enterprise "Deposit and investment insurance"	Deposit Guarantee Fund	Financial and Capital Market Commission	Guarantee Fund (*Tagatisfond*)	Kazakhstan Deposit Insurance Fund	B.D.	Bank Deposit Guarantee Fund
System specificity (formal (*explicit*)/unformal (*implicite*))	Explicit	Explicit	Explicit	Explicit	Explicit	Explicit	Explicit	Implicit
Form of the deposit guarantee system	Pay-Box Plus	Pay-Box Plus	Loss-Minimizer	B.D.	Pay-Box	Pay-Box Plus	B.D.	Pay-Box
Insurance amount / Deposit guarantee limit	100% of the total deposit amount in the bank per depositor	up to EUR 100 000 per depositor	UAH 200 000 (per individual, including principal and interests); (ie. 6853,78 euro*)	EUR 100 000 per depositor of the bank (on separate occasions up to EUR 200 000)	up to EUR 100 000 per depositor of the bank	KZT 10 mln (ie. 21476,71 euro)/ KZT 5 mln (ie. 10738,36 euro) (for national currency deposits / foreign currency deposits per depositor	100% of depositor's amount in the bank	100% of the total deposit amount in the bank per depositor
Source of funding	Private	Joint (Private / Public)	Joint (Private / Public)	Joint (Private / Public)	Joint (Private / Public)	Private	Private	Joint (Private / Public)
The sphere of administration	Public	Public	Public	Public	Public and Private	Public	Public	Public

* in Euro, as of April 23, 2020.

Table 1 (part 2). Comparison of deposit guarantee systems in the post-Soviet countries

Category	Russia	Moldova	Armenia	Azerbaijan	Kyrgyzstan	Tajikistan	Georgia
Entity responsible for deposit guarantees	Deposit Insurance Agency	Deposit Guarantee Fund in the banking system	Armenian Deposit Guarantee Fund	Azerbaijani Deposit Insurance Fund	B.D.	Individual Deposit Insurance Fund	LEPL The Deposit Insurance Agency of Georgia
System specificity (formal (*explicit*)/unformal (*implicite*))	Explicit	Explicit	Explicit	Explicit	Explicit	Explicit	Implicit
Form of the deposit guarantee system	Loss-Minimizer	Pay-Box Plus	Pay-Box	Loss Minimizer	B.D.	Pay-Box Plus	Pay-Box
Insurance amount / Deposit guarantee limit	RUB 1 400 000 (total amount of deposits per depositor in one bank) (ei. 17365,56 euro*)	MDL 6000 per depositor irrespective of other amounts placed in a bank (ei. 303,49 euro*)	10 mln AMD (tj.19363,73 euro*) per depositor, in foreign currency and 5 mln AMD (ei. 9681,86 euro*) dla depozytów denominowanych w walucie obcej	100 % (but no more than AZN 30 000 (ei. 16388,81 euro*) – In the next years, it is planned to cover 100% of deposits per depositor without limits	KGS 100 000 (ei. 1154,63 euro*) per individual	Up to 350 indicators of calculation per depositor (determined by separate legislation)	B.D.
Source of funding	Joint (Private / Public)	Joint (Private / Public)	Joint (Private / Public)	Private	Government – 76%, Banks – 24%	Prywatny/Publiczny	B.D.
The sphere of administration	Public	Public	Public	Public and Private	Public and Private	Public	B.D.

* in Euro, as of April 23, 2020

Source: own elaboration based on www1, access 15.03.2020; Horsch et al. 2018: 30–33.

As it can be seen from the above data, in the vast majority of the former Soviet Union countries there is a formal deposit guarantee system, ie the explicit system. Only Uzbekistan and Georgia have the informal form of a deposit guarantee system. Each country applying the Explicit System shall define this margin coverage limit. This means that in the event of the closure of an insolvent bank, the deposit guarantee institution pays out funds to eligible depositors up to the applicable limits. As can be seen from the above data, their amount varies greatly. The limit can be expressed as an absolute number (amount in a specific currency) or as a percentage (percentage of deposited deposits, bank capital or other volumes [Demirgüç-Kunt et al. 2015: 160–172].

An important aspect of the operation of guarantee systems is the source of funds for the implementation of guarantee payments. These funds may come from members of the guarantee system or from other institutions of the country's financial safety net[3]. In particular, they may come from the state budget (then we are dealing de facto with government guarantees). Another way is financing only by banks that are members of the guarantee system. In such systems, there may also be participation in the costs of payments by other institutions, most often the central bank. Most post-Soviet depository protection systems are financed by the government and banks in certain proportions. Turkmenistan, Belarus, Kazakhstan and Azerbaijan operate deposit guarantee systems based solely on private funds, i.e. from banks and other financial institutions.

The administration of the guarantee system concerns many aspects, i.e. the specificity of legal regulations, the powers of the basic bodies managing the institution and its location in the national financial safety net. First of all, establishing the guarantee institution in the financial sector has a very important role. Generally, the administration of the deposit guarantee scheme can be of three types: it can be private, public or mixed. The criteria for selecting the appropriate method of administration is related to the way the institution was established[4], it is also the result of historical conditions, as well as the current experience of managing financial security institutions in a given country [Obal 2004: 61]. Themanaging bodies may include representatives of various institutions. As for the administrative body, most of the post-Soviet countries have a public administration, as this form is considered to be the best way to maintain the efficiency of the deposit insurance system in an unstable economic environment

[3] The financial safety net is essential for maintaining the safety of financial institutions and markets. The activities of the institutions belonging to the network are to limit the possibility of financial problems arising in individual institutions subject to regulations, as well as systemic phenomena.

[4] If the guarantee system was created on a bottom-up initiative (that is, as a result of self-regulation of the banking community, it usually has a private administration, remaining fully under the control of the bank. In other cases, the central bank and/or finance ministries are more important).

[Horsch et al. 2018: 35]. Adopting this form means that the guarantee system is managed by representatives of safety net institutions and the national authority.

The conducted analysis shapes a rather heterogeneous picture of depository systems in post-Soviet countries.

3. DEPOSIT GUARANTEE SYSTEMS IN THE RESEARCHED COUNTRIES

This study presents the effects of actions taken by institutions guaranteeing deposits in Russia and the United States. The deposit guarantee systems developed since the 1930s. This does not mean that all countries have had such structures for a long time.

In 1933, the world's first deposit guarantee institution was established in the United States. This shows how important the role of the banking sector has been in a country with a market economy for many years. On the other hand, Russia is a country that emerged after the collapse of the Soviet Union, where deposit guarantees were normalized in 2003. It is possible that this is a consequence of the crises in the banking sector and connected with this the country transition from a centrally planned economy to a market economy in the 1990s.

The deposit guarantee institutions in the surveyed countries are described below and the effects of their activity are presented.

3.1. Russia

Until 2004, there was no deposit protection system in banks in the Russian Federation. It was only the crisis of 1998 that realized the need to introduce a deposit guarantee system. The cause was massive withdrawals from banks – a banking panic that led to the collapse of more than 200 banks in Russia.

On the basis of the Law „On insurance of household deposits with banks of the Russian Federation" (No. 177-FZ of 23.12.2003)[5] the Deposit Insurance Agency (DIS) was established. The main purpose of DIS is to ensure the efficient operation of the insurance system for bank deposits of individual customers. This institution, together with the Bank of Russia, banks licensed to accept deposits from natural persons (banks entered in the register of banks covered by the deposit guarantee scheme) and depositors, forms a deposit guarantee scheme in Russia.

The Russian deposit guarantee system works in the form of a loss minimizer. The entity guaranteeing the deposits is entitled to:

[5] This law was passed by the State Duma on November 28, 2003, approved by the Council of the Russian Federation on December 10, 2003, and signed by the President of the Russian Federation on December 23, 2003. Published in Sobrania zakonodatielstwa Rossijskoj Fiedieraciji ot 29.12.2003, No. 52, item 5029.

– return of insured funds to depositors upon the maturity of the guarantee,
– monitoring the accumulation of the deposit insurance fund,
– liquidation of failed banks,
– solving problems of systemically important banks,
– administration of guaranteeing the rights of the insured in the compulsory pension system.

Membership in DIS is compulsory for deposits of individual customers. Corporate deposits, bearer deposits and fiduciary deposits are excluded.

Since the implementation of the deposit guarantee system until 2018, the guaranteed amount increased fourteen times. In 2004, deposits were fully guaranteed up to the amount of 100 thousand RUB ($ 1,545.13). In 2018, the guaranteed amount was 1.4 million rubles (deposits in foreign currencies are guaranteed up to the equivalent of 1.4 million RUB – when the guarantee is met, they are paid in rubles and converted at the exchange rate set by the CBR). The guaranteed amounts are paid to depositors from the fund of obligatory deposit insurance. The compulsory deposit insurance fund is the sum of cash and other assets that are used exclusively for payments for insuring personal deposits with Russian banks [Żukowska and Żukowski 2011: 60]. In 2005, 931 banks belonged to the system, ie approx. 77% of all credit organizations operating at that time. The banks participating in the system collected 99% of the total deposits of the population and managed 94.6% of the assets of the entire banking sector [Żukowska and Żukowski 2011: 70].

Four charts showing the results of the activities of the Deposit Insurance Agency are presented below:
– number of events requiring the fulfillment of the warranty,
– amount of guarantee payments,
– number of banks closed,
– the number of banks where restructuring activities were carried out.

The data presented in Figure 1 indicate the number of events in the Russian banking sector which required the fulfillment of a deposit guarantee. The chart shows two periods of increase in the number of events requiring the payout of guaranteed deposits. The first is 2008–2009. The increased number of warranty events was most likely related to the effects of the financial crisis [Domańska 2016: 1–3]. The second period is 2013–2018. The reduction in the number of banking institutions in the Russian banking sector and, at the same time, the increase in the number of events requiring the payment of deposit guarantees is related to the process of withdrawing licenses from banks that do not meet the requirements for operating in the sector, introduced since 2013 [Golubev et al. 2019: 3–5]. The data above confirm that the Russian deposit guarantee system is responding to developments in the banking sector.

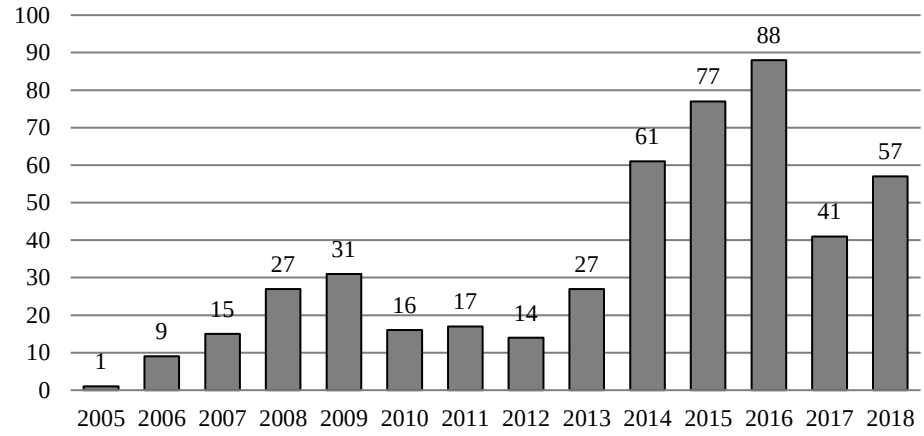


Chart 1. Number of events requiring the fulfillment of guarantees by DIS in 2005–2018

Source: own study based on: Annual report of the State Corporation „Deposit Insurance Agency" for 2018.

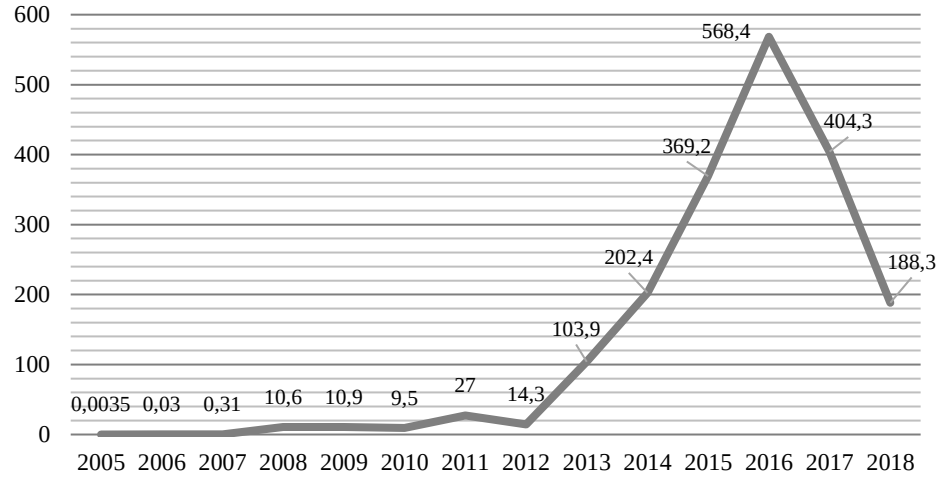
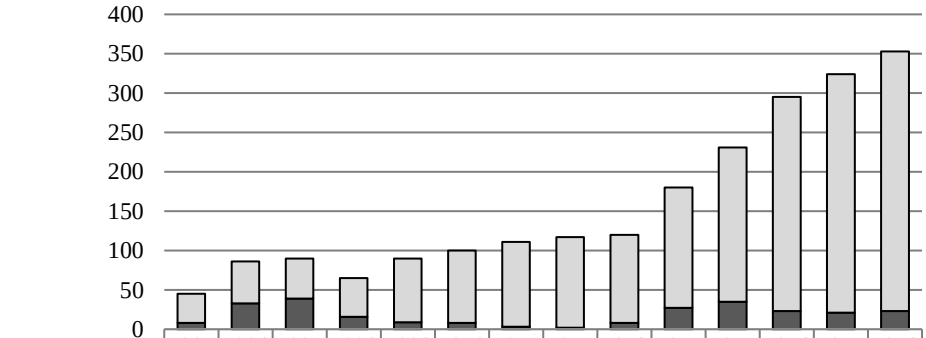


Chart 2. The amount of guarantee payments (in billion RUB)

Source: own study based on: Annual report of the State Corporation „Deposit Insurance Agency" for 2018.

Chart 2 presents data on the amount of disbursement of deposit guarantees. There is a noticeable difference between the amount of payments and the number of events that meet the conditions for the payment of guaranteed funds. You can see a steady increase in the payout value in the chart. The exception is 2012, when there was a decrease in payments. Since 2013, the effects of the introduction of measures aimed at stabilizing the banking sector in Russia, and thus an increase in the concentration of banking sector assets, can be observed. Stabilizing activities are aimed at withdrawing licenses from non-compliant banks [Khromov 2017: 140]. The effect of withdrawing the license is an increase in the payment of deposit guarantee funds. In 2017–2018, a decrease in the value of payments can be observed. This may mean a slow stabilization in the Russian banking sector.

Chart 3 shows the increase in DIS activities in the scope of introducing receivership and liquidating banks. The data shows an increase in the activities of receivership in many entities. This means that banks were more often subject to organized liquidation. In few entities there was a situation that forced liquidation. As with the previous results of DIS activity, an increase in statistics for the period after 2013 can be observed.



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Receivership	37	53	51	49	81	92	108	115	112	153	196	272	303	330
Liquidation	8	33	39	16	9	8	3	2	8	27	35	23	21	23

Chart 3. Number of liquidated banks

Source: own study based on: Annual report of the State Corporation „Deposit Insurance Agency" for 2018.

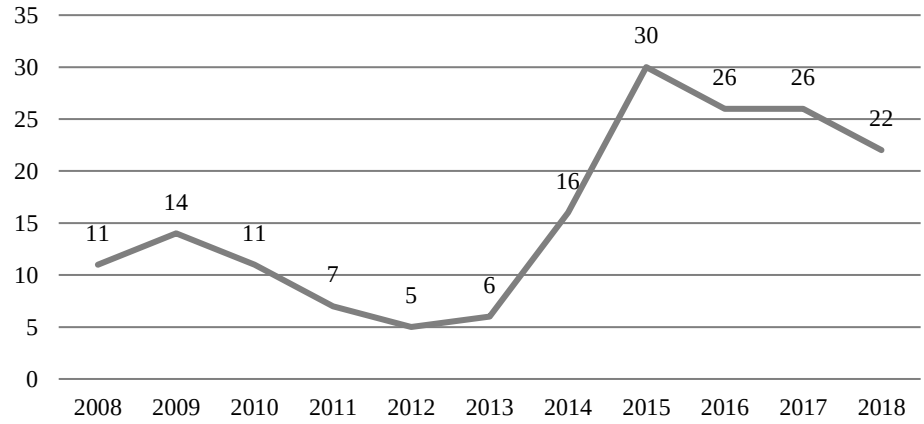


Chart 4. Number of banks where restructuring activities conducted by DIS were carried out

Source: own study based on: Annual report of the State Corporation „Deposit Insurance Agency" for 2018.

The last indicator covers the number of projects aimed at preventing bank failures at the end of the year. The chart shows data for the period 2008–2018 as DIS was granted restructuring powers in 2007. The data shows two periods of increased number of restructuring projects:

– 2008–2010,
– 2013–2018.

The activities for the period 2008–2010 were related to the global financial crisis. On the other hand, the increased number of corrective actions in the period 2013–2018 is due to the implementation of the enforcement of the rules governing the operation of banks in the Russian banking sector.

The data presented above indicate numerous activities of DIS in the area of disbursement of guaranteed deposits, liquidation and restructuring of banks. The intensified activities in the period 2013–2018 are primarily related to the introduction by the Central Bank of Russia in cooperation with the Russian Government of measures aimed at ensuring the stability of the Russian financial market. Since 2013, these actions resulted in the withdrawal of licenses from 332 banks that violated the laws regulating the Russian financial sector [Kruglova and Ushakova 2017: 5].

3.2. United States

The institution that guarantees deposits in the US is the Federal Deposit Insurance Corporation (FDIC). This entity was established in 1933 by the US Congress. This institution has the longest history among all functioning deposit guarantee institutions in the world. It covers banks that belong to the Federal Reserve system, as well as those state banks that have voluntarily agreed to participate in the system [Małecka and Włodarczyk 2012: 523–530].

The FDIC operates as a risk minimizer in order to maintain the stability of the banking sector, it has the power to:

– research and supervision of financial institutions in the field of consumer protection,
– restructuring of complex financial institutions,
– receivership.

Deposits covered by a guarantee.
The deposit guarantees cover all types of deposits up to the equivalent of USD 250,000 per depositor.
The graphs below show the performance of the FDIC in the period 2004–2018. The study included three quantities:

– number of bank failures,
– value of deposits in banks that have failed,
– the number of active receivership.

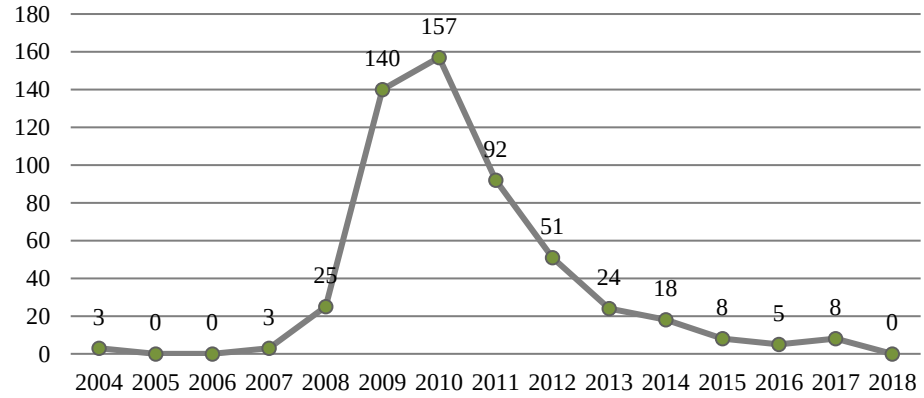


Chart 5. Number of bank failures in the US

Source: own study based on annual reports on the activities of the FDIC.

Chart 5 shows the number of bank failures in the United States in the period 2004–2018. Data from the FDIC's annual reports show a significant increase in bankruptcies of banking institutions since 2008. The highest increase was recorded in 2009. However, the largest number of institutions went bankrupt in 2010. In the following years the number of institutions that became insolvent decreased to reach the level of 0 in 2018. It is probable that the large number of bank failures in 2008–2014 was affected by the financial crisis that began in 2007. The aforementioned crisis was of great importance for the changes in the US banking sector [Abdymomunov et al. 2019: 115–116].

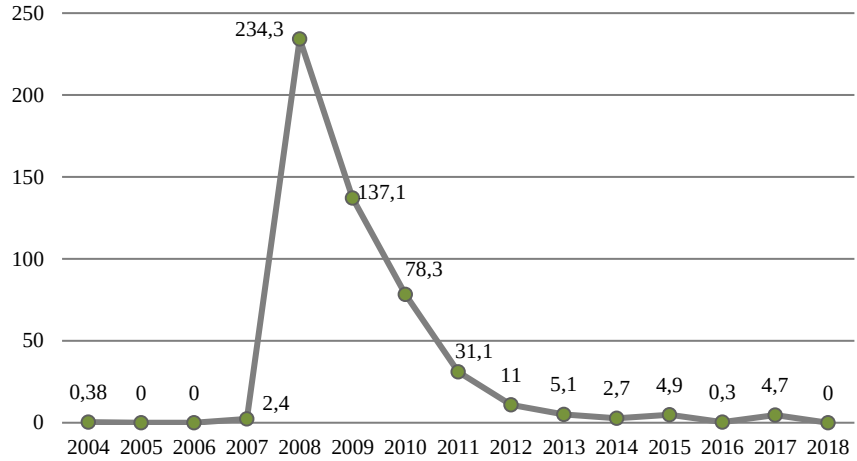


Chart 6. Value of deposits with banking institutions that went bankrupt with the US (in USD billion)

Source: own study based on annual reports on the activities of the FDIC.

The second important effect of the FDIC's operation is the value of deposits with banking institutions, the payment of which required at least partial coverage with funds from the deposit guarantee system. The value of this deposits increased very quickly in 2008. These results were probably the result of the financial crisis in 2007. The highest value of deposits in bankrupt entities for 2008 shows that in this period the problems most probably faced the biggest banks with which significant funds were deposited. After 2008, a downward trend in the value of deposits in bankrupted banks is noticeable.

Another effect of the FDIC's operation is the number of active receivership boards in bankruptcy institutions. The receivership is aimed at, among others, the orderly liquidation of the entity, resale of its assets and payment of creditors.

The figures given represent active receivership. This means that these institutions are currently conducting receivership actions initiated in this year and in previous years. The number of active receivership is shown in Chart 7.

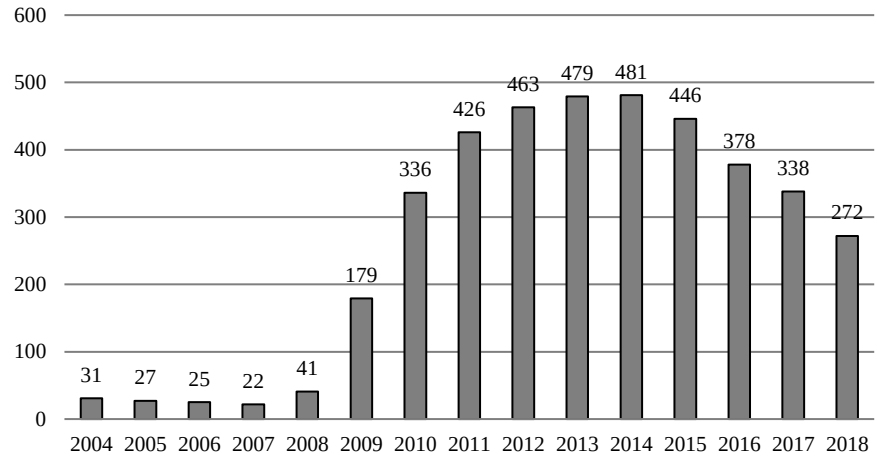


Chart 7. Number of active receivership boards over institutions subject to bankruptcy

Source: own study based on annual reports on the activities of the FDIC.

The chart above shows changes in the number of active receivership. The data presented in Chart 7 show the role of the financial crisis of 2007–2009 for the increase in the introduced measures related to the liquidation of banking institutions [Abdymomunov et al. 2019: 115]. The highest number of active receivership was observed in 2014. Since then, the FDIC has dissolved more receivership than it introduces. According to the data from the FDIC report (FDIC, 2018) in 2018 the number of new receivership boards was 0, while the number of dissolved boards was 66. This means that the banking sector in the United States is probably stabilizing. The number of entities at risk of bankruptcy is decreasing.

The results of the FDIC's activities indicate that the United States' deposit guarantee institution is fulfilling its tasks well. The 2007–2009 financial crisis was a kind of test for the operational efficiency of the FDIC. During this period, there was a noticeable increase in the demand for the activities of the deposit guarantee institution. The current data point to the smooth operation of the FDIC and the slow stabilization of the situation in the US banking sector.

CONCLUSIONS

The protection of deposits placed in banking systems is certainly an essential element to ensure an appropriate degree of confidence in the financial system. The lack of such protection significantly increases the risk of disruptions to the sector's liquidity, because as a result of the „banking panic" it may lead to a crisis in the entire banking sector and result in many negative consequences for the entire economy. When considering the formula for the functioning of the deposit guarantee system in individual countries, a number of criteria should be taken into account. First of all, the fact for what purpose the institution was established. Taking a holistic view, not only internal factors (economic conditions, condition of the financial sector, legal regulations in a given country) will be important, but also a number of external factors, such as, for example, international standards (e.g. guidelines of the International Monetary Fund), regulations at the global level, solutions adopted in other countries and their experiences with the functioning of deposit guarantee schemes.

The authors achieved the goal by reviewing the literature on deposit guarantee systems in the studied countries and presenting the most important effects of their activities. Institutions guaranteeing deposits in these countries differ in the form of operation and the scope of competence. They also differ in the length of the functioning period – experience. FDIC (USA) was established in 1933, while DIS (Russia) was established in 2003. The conducted research seems to confirm the accepted research hypothesis that the institution guaranteeing deposits in Russia is more burdened with systemic activities. During its operation, DIS has undergone two periods of intense work. The first was related to the outbreak of the global financial crisis. The second is the result of the actions of DIS and the Central Bank of Russia (Central Bank of Russia) aimed at liquidating entities that do not meet the requirements for functioning in the Russian banking sector. Until 2018, a high number of bank liquidations, the size of guarantee payments and restructuring activities in entities at risk are noticeable. In the case of deposit guarantee institutions in the United States, the worst period with the beginning of the 2007–2009 financial crisis should be mentioned. The effects of the crisis are still visible in the number of receiverships in the US banking sector.

BIBLIOGRAPHY

Abdymomunov A, Curti F., Mihov A, 2019, *U.S. Banking Sector Operational Losses and the Macroeconomic Enviroment*, „Journal of Money, Credit and Banking", vol. 52, no. 1.

Aharony J., Swary I., 1983, *Contagion Effects of Bank Failures: Evidence from Capital Markets*, „Journal of Business", vol. 56, no. 3.

Baka W. (red.), 2005, *Systemy gwarantowania depozytów w Polsce i na świecie: dziesięć lat Bankowego Funduszu Gwarancyjnego*, PWE, Warszawa.

Cerron R., 2018, *Deposit guarantee reform in Europe: does European deposit insurance scheme increase banking stability?*, „Journal of Economic Policy Reform", vol. 21, no. 3.
Chan A., Godwin A., Ramsey I., 2018, *Depositor preference and deposit insurance schemes – challenges for regulatory convergence and regulatory coordination in Asia*, „Law and Financial Markets Review", vol. 12, no. 2.
Constantinescu L.A., 2015, *Challenges For Deposit Insurance And Financial Stability In European Cooperative Banks*, „Knowledge Horizons – Economics", vol. 7, no. 3.
Demirgüç-Kunt A., Kane E.J., Laeven L., 2007, *Determinants of Deposit-Insurance Adoption and Design*, „Journal of Financial Intermediation", vol. 17(3).
Demirgüç-Kunt A., Kane E.J., Laeven L., 2015, *Deposit insurance around the world: A comprehensive analysis and* database, „Journal of Financial Stability", vol. 20.
Domańska M., 2016, *Rosyjski sektor bankowy: rok w kryzysie*, Komentarze OSW Ośrodek Studiów Wschodnich im. Marka Karpia, nr 204 [access 24.03.2016].
FDIC, 2018, Federal Deposit Insurance Corporation, Annual Report.
Golubev A., Rodionov A., Ryabov O., 2019, *Analysis of the transformation of the Russian banking system*, IOP Conf. Series: Materials Science and Engineering 497, https://doi.org/10.1088/1757-899X/497/1/012041.
Horsch A., Sysoyeva L., Bogma S., 2018, *Deposit insurance systems of post-Soviet countries: A comparative analysis*, „Journal of International Studies", vol. 11(4).
Howarth D., Quaglia L., 2018, *The difficult construction of a European Deposit Insurance Scheme: A step too far in Banking Union?*, „Journal of Economic Policy Reform", vol. 21.
Khromov M., 2017, *Russia's banking sector*, [w:] Sinelnikov-Murylev (red.), *Russian Economy in 2016*, Trends and Outlooks (Issue 38), Moskwa.
Kruglova A., Ushakova Y., 2017, *Effect of Banking Sector Resolution on Competition and Stability*, „Bank of Russia Working Papers", no. 22.
Li B.Z.L., Zhou Y., Yang W., 2019, *How Does Information Disclosure Affect Bank Systemic Risk in the Presence of a Deposit Insurance System?*, „Emerging Markets Finance and Trade", vol. 55:11, pp. 2497–2522.
Małecka E., Włodarczyk B., 2012, *Systemy gwarantowania depozytów – konwergencja rozwiązań stosowanych w krajach Unii Europejskiej*, „Zarządzanie i Finanse", r. 10, no. 4, pp. 1, 521–535.
Merton R.C., 1977, *An Analytic Derivation of the Cost of Deposit Insurance and Loan Guarantees*, „Journal of Banking and Finance", vol. 1, pp. 3–11.
Obal T., 2004, *Podstawowe cechy systemów gwarantowania depozytów i działalności pomocowej w państwach Unii Europejskiej – wnioski dla Polski*, „Bezpieczny Bank", nr 1(22).
Official Journal of the European Communities, L 135/5, Directive 94/19 / EC of the European Parliament and of the Council of 30 May 1994 on deposit-guarantee schemes.
Pawlikowski A., 2004, *Zróżnicowanie systemów gwarantowania depozytów. Analiza różnych wariantów rozwiązań*, „Bank i Kredyt", no. 10.
Rolnick A.J., 2010, *Interview with Thomas Sargent*, „Federal Reserve Bank of Minneapolis The Region", June.
Savchenko T.G., Kovács L., 2017, *Trust in the banking sector: EU experience and evidence from Ukraine*, „Financial Markets, Institutions and Risks", vol. 1(1).
Semenova M., Shapkin A., 2019, *Currency Shifts as a Market Discipline Device: The Case of the Russian Market for Personal Deposits*, „Emerging Markets Finance and Trade", vol. 55, pp. 2149–2163.
Zaleska M., 2007, *Współczesna bankowość.* Tom I, Difin, Warszawa.
Zdanowicz B., 2007, *Podstawowe dylematy i kryteria wyboru formuły systemu gwarantowania depozytów w świetle teorii i doświadczeń międzynarodowych*, „Bezpieczny Bank", vol. 1, no. 34.
Żukowska H., Żukowski M., 2011, *System gwarancji depozytów bankowych osób fizycznych w Rosji*, „Bezpieczny Bank", vol. 3, no. 45.

[www1] https://www.iadi.org/en/deposit-insurance-systems/dis-worldwide/ [access 15.03.2020].
[www2] https://www.iadi.org/en/core-principles-and-research/publications/glossary/paybox-plus/ [access 22.04.2020].
[www3] https://www.iadi.org/en/core-principles-and-research/publications/glossary/loss-minimiser/ [access 22.04.2020].

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STATE POLICY OF CONSUMER PROTECTION IN THE DIGITAL FINANCIAL SERVICES MARKET IN UKRAINE

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Abstract

The rapid development of digital financial technologies in Ukraine leads to the emergence of new risks and to significant consumers' losses in the financial market. The aim of the study is to develop strategic directions of state policy of consumer protection in the digital financial services market considering the best world practices and features of the financial system of Ukraine.
System scientific analysis was used to study the possibilities of implementing international quality standards for digital financial services in Ukrainian legislation. The method of statistical analysis of data was used to form the imperial basis of the study.
Based on the global experience and taking into account the peculiarities of Ukrainian fintech market the state policy should consist of three strategic directions: 1) create a system of legal regulation of the mechanism of protection of consumers' rights of digital financial services; 2) introducing a risk-oriented approach to regulating the digital financial services delivery process to consumers; 3) strengthening of digital financial literacy and public awareness. Such state policy will form a reliable system of consumer protection in the digital services market in Ukraine.

Keywords: financial consumer protection, digital financial services and products, public policy for consumer protection of digital financial services.

JEL Class: D18.

INTRODUCTION

The financial technology market (Fintech) is one of the fastest growing and holds leading positions in the dynamics of its development in terms of both financial performance and number of users. Experts from different countries note that over the past five years, the number of users of financial technologies has been increasing by 15–20% annually [Private financial..., 2018, access 1.02.2020]. Moreover, the distribution of Fintech products occurs in different consumer segments. Most of Fintech users no longer imagine their usual day without the use of technology. Thus, every third inhabitant of a large city (about 1 million inhabitants) uses more than two Fintech services on average daily. Experts estimate the spread of financial technology in Ukraine at 50% [Fintech. Guide…, 2018, access 10.02.2020].

A key factor driving the development of the financial technology market is the development of the Internet and digitalization. If at the beginning of the path of its development the market of financial technologies was limited to receiving payments and electronic money, now at the present time the most widespread is received by a number of services: P2P consumer lending, P2P property lending, balance sheet consumer lending, donation-based crowdfunding, demand deposits, saving accounts, P2P mobile payments, foreign exchange and remittances, cryptocurrency wallets, cryptocurrency exchange and trading, wealth and assets management, personal financial management, P2P insurance, usage-based insurance, robo advisors and etc.

Financial digital products and services bring significant benefits to a consumer. They reduce the value of a financial product, promote financial inclusions, help people to avoid extra commissions, save time for consumers, improve personal financial management, and increase well-being. However, digital financial services (DFS) carry significant risks, such as: insufficient security of systems while storing personal data, disability of systems that impede access to funds, inconvenient interfaces that increase the number of erroneous transactions, insufficient liquidity of providers of DFS, lack of guarantees of a returning money accumulated in non-bank financial institutions accounts, digital fraud and more. This creates new challenges for financial regulators in the form of a state regulatory policy for the protection of consumers of digital financial services.

The main purpose of research is to develop approaches for state policy for the protection of consumers of digital financial services in Ukraine, considering the high-level principles for digital financial inclusion and their practical application in the field of protection consumer rights in DFS.

1. THE RESEARCH METHODOLOGY

To study the current situation of the development of the digital financial services market in Ukraine the method of statistical data analysis was applied. The sources of data were materials from international consulting agencies, the Ukrainian Association of Fintech and Innovation companies, the National Bank of Ukraine, VISA company, Agency for International Development, (USAID). The systematic scientific analysis of the existing domestic legal field in the given direction was used in the development of conceptual foundations of the policy of protection consumers of digital financial services, and the prospects of harmonization of Ukrainian legislation with international standards were explored. When using the method of analogy, analysis and synthesis, and the method of theoretical generalization the strategic vectors of construction of the mechanism of consumer rights protection in DFS in Ukraine were developed.

2. THE RESEARCH RESULTS

The digital financial services market is booming in Ukraine. There are several reasons for this. So, as of 2019, the proportion of people using the Internet was 65%, the penetration rate of smartphones was 70%, the coverage level of 3G and higher was 62% [Ukrainian Institute…, 2020, access 2.02.2020]. The Internet and its speed in Ukraine are constantly improving, also because of reducing the cost and increasing the access, especially in the mobile Internet. Continuous investments and support for high-speed internet contributes to the development and use of fintech services and products in the country.

The level of penetration of financial services is increasing every. The proportion of people aged 15+ who had an account with a financial institution was 63% (22.5 million), 49% had a debit card, 39% used a card to make a purchase, 29% – used the internet to pay bills or make payments, 18% used the internet to access a financial account in 2017 [Fintech. Guide…, 2018, access 10.02.2020]. The share of non-cash transactions in the total volume of payment card transactions increased from 25.0% in 2014 to 49.7% at the end of September 2019 [Strategy of development.., 2020, access 10.02.2020].

The transition to digital finance is happening at a tremendous speed. In these circumstances, digital financial product and service providers have prioritize customer needs. Internet and mobile banking have significantly increased the number of banking transactions provided through these systems. Ukrainian banks offer to use smartphones not only to pay for goods and services, but also to receive payments. Innovative banks provide clients with multichannel service in 24/7 mode („State Savings Bank of Ukraine", „PrivatBank", „UkrSibbank" and

others). It became possible for Ukrainian consumers to apply for a loan through ATMs and SMS. Several direct credit platforms (P2P) have been launched. The technology of contactless payments is actively used by consumers. MasterCard, PayPass and Visa payWave allow to perform transactions simply by lifting a plastic card to the terminal. Electronic wallets are actively used when a payment is made in a point of sale.

The level of penetration of financial services continues to grow rapidly owing to the support of the development of state-level fintech market. Thus, in 2018, financial sector regulators have included the development of fintech as one of the priorities in the Comprehensive Program for the Development of the Financial Sector of Ukraine until 2020. The Cabinet of Ministers of Ukraine has identified the financial technologies and cashless payments as a strategic direction in the Concept of Development of the Digital Economy and Society of Ukraine for 2018–2020. In April 2019, the National Bank of Ukraine established an Expert Council on communication with innovative companies wishing to work in the financial market [Comprehensive Program…, 2018, access 15.03.2020].

According to an analytical study of the Ukrainian Association of Fintech and Innovation Companies there are more than 100 fintech companies operating in Ukraine, most of which have emerged in the last three years. Fintech providers work in the following areas: payments/money transfer – 38, mobile wallets – 22, digital/neobanks – 8, technology and infrastructure – 36, consulting/analytical systems – 26, personal and consumer lending – 10, business lending – 5, insurtech – 6, cybersecurity/anti-fraud – 11, regtech – 5, personal finance/wealth management – 6, digital comparison tool – 3, legaltech – 4 [Catalogue of fintech…, 2019, access 8.02.2020].

The rapidly growing consumer interest in Fintech products and the lack of a regulatory framework for regulating financial intermediaries in the face of implementing of innovative technologies and developing of new Fintech services with significant risks necessitate the creation of conceptual frameworks of state policy for protection of digital financial services users.

In January 2020, the National Bank of Ukraine, the National Securities and Stock Market Commission, the National Commission for the State Regulation of Financial Services Markets, the Ministry of Finance of Ukraine and the Deposit Guarantee Fund of Ukraine approved the Strategy for the Development of the Financial Sector of Ukraine until 2025 (Further – FSDU Strategy-2025).

The Strategy-2025 contains 5 key areas for the development of the financial sector, in particular: financial stability, macroeconomic development, financial inclusion, development of financial markets, innovative development 2019 [Strategy of development.., 2020, access 10.02.2020]. In order to understand how the system of consumer protection in the digital financial services market will be

formed, it is necessary to elaborate on such strategic directions of FSDU Strategy-2025 as financial inclusion and innovation development.

It is significant that state regulators are giving due priority to financial inclusion by increasing the accessibility and using of financial services. The main priorities for realization state policy in this way are: drafting and implementing the Financial Inclusion Strategy; creating conditions for development of remote distribution channels of financial services; creating the infrastructure to provide financial services in remote territories; conversing payments to the state to electronic channels; improving a regulatory framework to enhance effectiveness, competition and security of electronic payments in the financial system; accessibility of financial services for people with special needs.

In such circumstances, the protection of consumers of digital financial services should be ensured through the introduction of new models of remote identification and verification of the client, the creation of a mechanism for access of financial institutions to customer identification data in state registers (eKYC), regulation of the use of different types of electronic signatures of clients of financial institutions.

National regulators have identified increasing consumer protection in the financial services market as an important strategic objective of financial inclusion. To ensure this, state financial regulators have planned to complete such tasks: developing and introducing a regulatory framework for supervising the financial sector participants; ensuring transparency of information on commission and payments charged on services of banks and nonbank financial institutions, as well as payments guaranteed to the bank depositors and respective maturities; expanding the DFS participants and guaranteed deposits, gradual increase in the deposit guarantee amount in banks; improving means for disclosing information by financial institutions to customers, including prior to entering into agreements. The fulfillment of these obligations will allow to form the basis for safe use of financial services, including digital ones.

Low financial literacy in Ukraine is another challenge for financial authorities. The Financial Literacy Index the method of the Organization for Economic Cooperation and Development (OECD) reached 11.6 points out of 21, which is one of the lowest in the world [Financial literacy…, 2019, access 15.03.2020]. To remedy the current situation, financial regulators have committed by 2023 to focus their efforts on: creating a single communication platform (web-site) with useful insight on types and use of financial services; holding awareness raising campaigns for different demographic groups; opening the Information and Communications (Center in National Bank of Ukraine – Money Museum); implementing special programs for training expertise and skills in fintech for different groups of the general public.

The state strategic policy in the field of „Innovative development" includes the following tasks for realization during 2020–2025: devising and implementing the FinTech development strategy in Ukraine; introducing means for applying artificial intelligence and machine learning in finances (KYC, AML, combating fraud, personalized financial products, forecasting risks based on analysis of bank transactions, etc.); developing the framework for identifying customers using biometric data; introducing regulation for circulation and use of digital assets in Ukraine; introducing the framework set out in EU GDPR (General Data Protection Regulation) for finance [Strategy of development.., 2020, access 10.02.2020].

Concerning the increasing demand for digital financial products and services, the outlined strategic areas need to be detailed in terms of protecting the rights of consumers of digital financial services. The basis for the development and implementation of the Digital Consumer Financial Consumer Protection Strategy in Ukraine should be High-Level Principles for Digital Financial Inclusion (DFI Principles).

The DFI Principles were produced in 2016 by the Global Partnership for Financial Inclusion. The DFI Principles are focused on the need to provide the financially excluded and underserved with high-quality and appropriate financial products and services and the potential to use digital technologies to achieve this goal, where possible. The DFI Principles also recognize the need to actively balance the promise of digital innovation with the new risks that rapidly evolving technology introduces. There are 8 DFI Principles (Table 1).

Table 1. G20 High-Level Principles for Digital Financial Inclusion

Number	Title	Explanation
Principle 1	Promote a Digital Approach to Financial Inclusion	Promote digital financial services as a priority to drive development of inclusive financial systems, including through coordinated, monitored, and evaluated national strategies and action plans.
Principle 2	Balance Innovation and Risk to Achieve Digital Financial Inclusion	Balance promoting innovation to achieve digital financial inclusion with identifying, assessing, monitoring and managing new risks.
Principle 3	Provide an Enabling and Proportionate Legal and Regulatory Framework for Digital Financial Inclusion	Provide an enabling and proportionate legal and regulatory framework for digital financial inclusion, taking into account relevant G20 and international standard setting body standards and guidance.

Number	Title	Explanation
Principle 4	Expand the Digital Financial Services Infrastructure Ecosystem	Expand the Digital Financial Services Infrastructure Ecosystem Expand the digital financial services ecosystem – including financial and information and communications technology infrastructure – for the safe, reliable and low-cost provision of digital financial services to all relevant geographical areas, especially underserved rural areas.
Principle 5	Establish Responsible Digital Financial Practices to Protect Consumers	Establish a comprehensive approach to consumer and data protection that focuses on issues of specific relevance to digital financial services.
Principle 6	Strengthen Digital and Financial Literacy and Awareness	Support and evaluate programs that enhance digital and financial literacy in light of the unique characteristics, advantages, and risks of digital financial services and channels.
Principle 7	Facilitate Customer Identification for Digital Financial Services	Facilitate access to digital financial services by developing, or encouraging the development of customer identity systems, products and services that are accessible, affordable, and verifiable and accommodate multiple needs and risk levels for a risk-based approach to customer due diligence.
Principle 8	Track Digital Financial Inclusion Progress	Track progress on digital financial inclusion through a comprehensive and robust data measurement and evaluation system. This system should leverage new sources of digital data and enable stakeholders to analyze and monitor the supply of – and demand for – digital financial services, as well as assess the impact of key programs and reforms.

Source: G20/OECD (2016) High-Level Principles for Digital Financial Inclusion.

It is very important to consider the provisions of Principle 2: Balancing Innovation and Risk to Achieve Digital Financial Inclusion, Principle 5: Establish Responsible Digital Financial Practices to Protect Consumers and Principle 6: Strengthen Digital and Financial Literacy and Awareness for creating a national system of protection consumer rights in a digital age. A detailed explanation of these provisions and practical recommendations of implementing them into national strategies for policy makers are disclosed in the G20/OECD (2018) Policy Guidance on Financial Consumer Protection Approaches in the Digital Age and G20/OECD (2018) INFE Policy Guidance Digitalisation and Financial Literacy.

Policy Guidance on Financial Consumer Protection Approaches in the Digital Age helps policy makers with establishing responsible digital financial practices to protect consumers and build trust and confidence in digital financial services, by establishing a tailored approach to financial consumer protection that focuses on issues of specific relevance to digital financial services [Policy Guidance on Financial…, 2018, access 10.03.2020].

Policy Guidance Digitalisation and Financial Literacy aims to identify and promote effective initiatives that enhance digital and financial literacy in light of the unique characteristics, advantages, and risks of digital financial services and channels, to support their evaluation and dissemination, and to promote a responsible and beneficial development of digitalisation by building trust in the acquisition and use of digital financial services by the financially excluded [Policy Guidance Digitalisation…, 2018, access 25.03.2020].

Based on the analysis of the global experience of building a consumer rights protection mechanism in the digital services market and taking into account the peculiarities of the development of the fintech market in Ukraine, the state policy should be directed to the following three strategic directions: 1) create a system of legal regulation of the mechanism of protection of consumers' rights of digital financial services; 2) introducing a risk-oriented approach to regulating the digital financial services delivery process to consumers; 3) strengthening of digital financial literacy and public awareness.

The priority measures in creating a system of legal regulation of the mechanism of protection of consumer rights of digital financial services should be:

1) development of a legal mechanism for the protection of monetary funds accumulated in non-prudentially regulated service providers (financial companies, mobile operators and others);

2) creation of a legal basis for testing new innovative financial products and services, as well as business models in simplified mode (with the central bank to create a „Sandbox" communication platform);

3) development of the legal basis for regulating the activity of P2P credit platforms, crowdfunding and operations with virtual assets;

4) establishing on a legislative level the rules of using open API for all financial market participants;

5) development of rules of formation of unified databases and protection of information, determination of the order of exchange of information between databases;

6) creation of an effective mechanism for the out-of-court settlement of disputes, in particular to develop legal regulation of alternative mechanisms such as mediation, arbitration, financial ombudsman;

7) improving the institutional structure of the DFS consumer protection system, by setting up specialized consumer rights protection departments within the structure of each financial regulator and developing an effective mechanism for the exchange of information on consumers rights protection DFS with a view to further improving of legal regulation;

8) development of a comprehensive Consumer Rights Protection Strategy in the digital financial services market and an action plan for its implementation.

When adopting a risk-oriented approach in regulating process of providing digital financial services to consumers, financial authorities should focus on the following aspects of activities:

1) establishing requirements for the provision of complete and truthful information on innovative digital financial products, including commissions and tariffs, conditions of use of the service, the procedure for reporting to the consumer on the conducted transactions, disclosure of the procedure of consumer actions in conducting mistaken transaction and system outage;

2) upgrading and expanding the infrastructure of the retail payment system and open banking platforms, which will provide secure access to banks, non-banking financial institutions and new payment service providers;

3) the widespread use of government channels for the distribution of digital financial services with an adequate system of personal data protection;

4) enhancing security measures for the storage, unauthorized use, disclosure, modification and destruction of personal data; providing only the information required to complete a particular online transaction or to receive electronic services;

5) improvement of work of authorized bodies for control over compliance with the legislation on protection of personal data and protection of information in information networks;

6) protect consumers from misuse of digital product and digital crime; encourage of DFP providers to create user-friendly interfaces that reduce the likelihood of mistaken transactions;

7) development and implementation of new innovative methods of analysis of financial digital technologies for risk assessment, including cybercrime scenarios; for SupTech and RegTech to facilitate the faster, more efficient and effective enforcement of regulatory requirements by financial market participants;

8) establishing the cooperation with the private sector and risk assessment experts to promptly identify and evaluate the risks of digital financial services, to ensure the creation of an ecosystem that monitors these risks and helps to minimize them;

9) the establishment of internal departments in the financial institutions for the examination of consumer complaints and the obligation for them to formulate and report on the received complaints to the body responsible for protection of consumer rights DFS;

10) development of an effective mechanism for compensation of losses to DFS consumers in case of illegal activity of FDS providers;

11) providing support to consumers in identifying dependency on online lending and clarifying the procedure for repayment of overdue debts.

An important element in the formation of the consumer protection system in digital age is the provision of an adequate level of financial and technological knowledge in the population. This can be achieved by:

1) creating high-quality digital literacy education programs that shape the knowledge, understanding and confidence of consumers in using digital financial services (eg. online games for financial management training; digital income and expense tracking tools; interactive educational programs). Such financial literacy education programs should be continuous and tailored to target groups (teachers, school students, college students, retirees, journalists, judges);

2) use of digital (video, social networks, messengers, e-mail) and non-digital (posters, newspapers) channels to inform consumers about the features, benefits, costs of using digital financial services and means of financial security;

3) providing quality and uninterrupted customer support (24/7 call center, online chat bot, websites, social media) with simple and accessible instructions for correct action in any given situation, including the complaint mechanism.

By implementing appropriate measures to protect the rights of consumers of digital financial services, state regulators of the financial market will be able to start the process of transformation of legal regulation of the market of digital financial services, which will allow in the future to prevent uncontrolled situations due to increased impact of financial and operational risks, and to promote a reasonable balance between abidance of security and decentralization and ensuring of confidentiality and scale when providing digital financial services to consumers.

CONCLUSIONS

The rapid development of technology has significantly influenced the transformation in the financial sector of Ukraine, which has contributed to the emergence of new digital financial products and services. On the one hand, such products bring several benefits to the clients, and on the other – cause new risks. Thus, there is a need to improve the state policy of regulating the sphere of financial technological services. The formation of such policy should be in line with the EU Directives and OECD principles on open banking, protection of privacy and security of personal data when consuming digital financial services, creating a competitive environment by setting standard requirements for providers to enter the digital financial services market, ensuring the guarantees of security of the preservation of monetary client money, compliance with anti-money laundering and terrorist financing legislation. In such circumstances, the quality standards of digital financial services will be raised and a robust system of consumer rights protection in Ukraine will be formed.

BIBLIOGRAPHY

Catalogue of fintech companies in Ukraine in 2019, https://map.fintechua.org [access 15.03.2020].

Comprehensive Program for Development of the Financial Sector of Ukraine until 2020, https://zakon.rada.gov.ua/laws/show/v0391500-15 [access 15.03.2020].

Financial literacy, financial inclusion and financial well-being in Ukraine. Research results. USAID Financial Sector Transformation Project June 2019, http://www.fst-ua.info/wp-content/uploads/2019/06/Financial-Literacy-Survey-Report_June2019_ua.pdf?fbclid=IwAR2AlpnG%20Nn8big9d0_v6YEhNBwL [access 15.03.2020].

Fintech and consumer protection: A Snapshot, https://www.nclc.org/images/pdf/cons-protection/rpt-fintech-and-consumer-protection-a-snapshot-march2019.pdf [access 17.02.2020].

Fintech in Ukraine: Trends, Market Overview and Catalogue, https://www.slideshare.net/UNITCity/fintech-in-ukraine-2018-ukrainian-language [access 15.03.2020].

FinTech, RegTech and SupTech: What They Mean for Financial Supervision / Toronto Leadership Centre, https://res.torontocentre.org/guidedocs/FinTech%20RegTech%20%20and%20SupTech%20-%20What%20They%20Mean%20for%20Financial%20Supervision.pdf [access 15.03.2020].

Fintech. Guide, 2018, https://aequo.ua/publication/Insights/infographic_report_fintech_guide _2018/ [access 10.02.2020].

G20/OECD, 2011, Task Force on Financial Consumer Protection, https://www.oecd.org/daf/fin/financial-education/g20-oecd-task-force-financial-consumer-protection.htm [access 15.03.2020].

G20/OECD, 2016, High-Level Principles for Digital Financial Inclusion, http://www.oecd.org/g20/G20-OECD-Policy-Guidance-Financial-Consumer-Protection-Approaches-digital-age.pdf [access 10.03.2020].

G20/OECD, 2018, INFE Policy Guidance Digitalisation and Financial Literacy, https://www.oecd.org/g20/G20-OECD-Policy-Guidance-Financial-Consumer-Protection-Approaches-digital-age.pdf [access 15.03.2020].

IT Ukraine from A to Z // IT Ukraine report/ Ukraine Digital News:, http://www.uadn.net/files/ua_hightech.pdf [access 5.02.2020].

OECD, 2018, G20/OECD Policy Guidance on Financial Consumer Protection Approaches in the Digital Age, https://www.oecd.org/daf/fin/financial-education/G20-OECD-Policy-Guidance-Financial-Consumer-Protection-Digital-Age-2018.pdf [access 15.03.2020].

OECD/INFE, 2012, High-level Principles on National Strategies for Financial Education, https://www.oecd.org/daf/fin/financial-education/OECD-INFE-Principles-National-Strategies-Financial-Education.pdf [access 15.03.2020].

Private financial technologies as a tool for sustainable business development in Russia and Kazakhstan. Trends in the market of financial technologies, Deloitte Research Center in the CIS, 2018, https://www2.deloitte.com/content/dam/Deloitte/ru/Documents/research-center/Chastnye-finansovye-tekhnologii-kak-instrument-ustojchivogo-razvitiya-biznesa-Rossii-Kazahstane.pdf [access 1.02.2020].

Strategy of development of the financial sector of Ukraine until 2025, https://bank.gov.ua/admin_uploads/article/Strategy_FS_2025.pdf [access 10.02.2020].

Ukrainian Institute of the Future „Ukraine-2030E – a country with advanced digital economy" https://strategy.uifuture.org/kraina-z-rozvinutoyu-cifrovoyu-ekonomikoyu.html#6-2-3 [access 2.02.2020].

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POLSKI RYNEK OBLIGACJI NIESKARBOWYCH – NOWE ZASADY REJESTRACJI OBLIGACJI ORAZ ANALIZA REJESTRU ZOBOWIĄZAŃ EMITENTÓW

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Streszczenie

Po aferze Getback SA, w celu wzmocnienia nadzoru nad rynkiem obligacji, stworzono specjalny Rejestr Zobowiązań Emitentów (RZE), który ułatwia inwestorom wyszukiwanie informacji na temat papierów dłużnych. Rejestr ten po raz pierwszy ujawnił rzeczywisty rozmiar oraz kilka ważnych cech polskiego rynku obligacji nieskarbowych. Pierwszym celem artykułu jest pokazanie istotnych zmian prawa dotyczących rejestracji obligacji oraz ich potencjalnego wpływu na dalszy rozwój rynku. Drugim celem jest ukazanie nieznanej dotąd skali i głównych cechy rynku obligacji, w tym w szczególności obligacji komunalnych.

Pierwsza hipoteza brzmi: obowiązkowa rejestracja obligacji w KDPW wraz z publicznie dostępnym Rejestrem Zobowiązań Emitentów poprawiły przejrzystość i poziom bezpieczeństwa polskiego rynku obligacji nieskarbowych oraz ułatwiły obrót tymi papierami na rynku wtórnym. Druga hipoteza brzmi: Rejestr Zobowiązań Emitentów jest pierwszym publicznie dostępnym narzędziem do kompleksowej analizy polskiego rynku obligacji nieskarbowych, który ujawnił m.in. duże rozdrobnienie emitentów (w szczególności w obligacjach samorządowych), dominację emitentów kontrolowanych przez Skarb Państwa, przewagę obligacji o zmiennym oprocentowaniu oraz znaczącą liczbę obligacji zarejestrowanych poza KDPW.

Słowa kluczowe: obligacje, obligacje komunalne, obligacje nieskarbowe, rejestr obligacji, rejestr zobowiązań emitentów.

JEL Class: G10, G18, O16.

WSTĘP

Skutkiem afer finansowych jest spadek zaufania inwestorów do rynku finansowego. Remedium na dostrzeżone po czasie patologie stają się przeważnie nowe przepisy i obostrzenia wzmacniające nadzór nad rynkiem finansowym. Przykładem jest afera spółki Getback SA, której obligacje w nieuczciwy sposób masowo oferowano osobom fizycznym. Jednym ze skutków tej afery była gruntowna przebudowa polskiego prawa w zakresie obligacji, w tym wprowadzenie obowiązku rejestracji obligacji w Krajowym Depozycie Papierów Wartościowych (KDPW). W ramach wzmocnienia nadzoru nad rynkiem obligacji stworzono specjalny Rejestr Zobowiązań Emitentów (RZE), który ułatwia inwestorom wyszukiwanie informacji na temat papierów dłużnych.

Pierwszym celem artykułu jest pokazanie istotnych zmian prawa dotyczących formy rejestracji obligacji oraz ich potencjalnego wpływu na dalszy rozwój rynku. Drugim celem jest ukazanie nieznanej dotąd skali i głównych cech polskiego rynku obligacji nieskarbowych.

Pierwsza hipoteza brzmi: obowiązkowa rejestracja obligacji w KDPW i publicznie dostępny Rejestr Zobowiązań Emitentów poprawiły przejrzystość i bezpieczeństwo rynku obligacji nieskarbowych ułatwiając obrót na rynku wtórnym. Druga hipoteza brzmi: Rejestr Zobowiązań Emitentów jest pierwszym publicznie dostępnym narzędziem do kompleksowej analizy polskiego rynku obligacji nieskarbowych, który ujawnił m.in. duże rozdrobnienie emitentów (w szczególności w obligacjach samorządowych), dominację emitentów kontrolowanych przez Skarb Państwa, przewagę obligacji o zmiennym oprocentowaniu oraz znaczącą liczbę obligacji zarejestrowanych poza KDPW.

W artykule zastosowano głównie dwie metody badawcze, tj. badanie literatury i aktów prawnych oraz badanie statystyczne w oparciu o dane z RZE na dzień 30 kwietnia 2020 r.

1. REFORMA RYNKU OBLIGACJI NIESKARBOWYCH

W dniu 2 maja 2018 r. spółka Getback SA złożyła wniosek o otwarcie postępowania restrukturyzacyjnego [Getback 2018]. Był to jeden z największych w Polsce emitentów obligacji, mających zarówno formę zdematerializowaną (tj. zapisu elektronicznego), jak i dokumentową[1] (tj. formę materialną). Zgodnie z pierwotnym brzmieniem art. 8 ustawy o obligacjach, obligacje w formie zdematerializowanej mogły być zapisane w ewidencji prowadzonej m.in. przez firmy inwestycyjne i banki [Dz.U. 2015, poz. 238].

[1] Informacje o emisjach obligacji w formie dokumentowej można znaleźć m.in. w raportach EBI Getback SA, np. w raporcie EBI 39/2017 z 7 kwietnia 2017 r.

Przyczyną, dla której spółka Getback SA emitowała obligacje w formie materialnej[2], mogły być niższe koszty emisji z uwagi na brak pośrednictwa podmiotu prowadzącego ewidencję obligacji. Dawało to również spółce potencjalną możliwość dodatkowego wynagradzania osób oferujących jej obligacje.

Obligacje materialne w swej naturze nie były niczym złym – dzięki uproszczonej formie wykorzystywano je chociażby do emisji w ramach grup kapitałowych (tzw. *intercompany*), gdzie zarówno emitentami, jak i obligatariuszami były spółki z tej samej grupy kapitałowej[3]. Celem tego zabiegu była optymalizacja podatku PCC[4]. Obligacje typu *intercompany* pod kątem wartości nominalnej stanowiły ok. 23% wszystkich obligacji przedsiębiorstw [Fitch Polska 2020].

Przed reformą, obligacje zdematerializowane (w formie zapisu elektronicznego) mogły być zarejestrowane zarówno w ewidencjach banków i domów maklerskich, jak i w Krajowym Depozycie Papierów Wartościowych (KDPW). Tylko rejestracja obligacji w KDPW dawała możliwość wprowadzenia obligacji do obrotu giełdowego. Obrót obligacjami nie mającymi formy dokumentu, ale zapisanymi w ewidencjach (poza KDPW), był możliwy tylko na rynku OTC[5]. Handel nimi był technicznie utrudniony, ponieważ obie strony transakcji musiały mieć założone rachunki powiernicze (ew. subdepozytowe[6]) w tej samej instytucji, która te papiery przechowywała w swej ewidencji. Rejestracja obligacji w centralnym depozycie KDPW upraszcza zatem operacyjnie obrót wtórny obligacjami. Historyczne i obecne formy rejestracji obligacji pokazano na rysunku 1.

Afera Getback jest przykładem *missellingu*[7], gdzie główną rolę odegrały obligacje. Dla wielu obligatariuszy Getback SA był to pierwszy kontakt

[2] Warto podkreślić istotnie wyższe ryzyko posiadania obligacji materialnych (np. ryzyko utracenia lub uszkodzenia dokumentu) w stosunku do obligacji zdematerializowanych, które mogły być zapisywane tylko w rejestrach podmiotów profesjonalnych lub w KDPW.

[3] Przykładem obligacji *intercompany* zapisanych w ewidencjach firm inwestycyjnych i banków są obligacje PGE Górnictwo I Energetyka Konwencjonalna SA oraz ENEA Wytwarzanie Spółka z o.o., widoczne w tabeli 2.

[4] Zgodnie z art. 7 ust. 1 pkt 3 ustawy z dnia 9 września 2000 r. o podatku od czynności cywilnoprawnych [Dz.U. 2020, poz. 815 z późn zm.] stawka podatku od umowy pożyczki wynosi (od 01.2019 r.) 0,5% (wcześniej 2%).

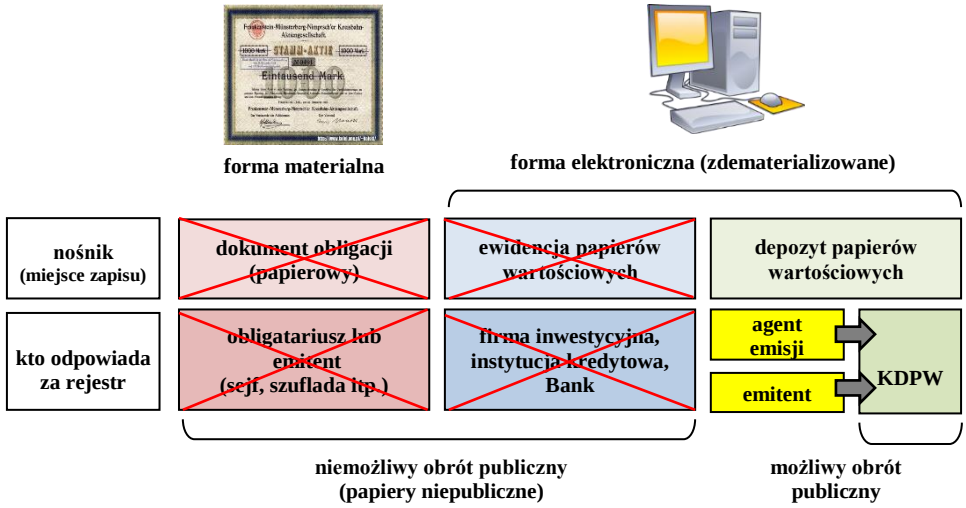
[5] Jest to rynek, gdzie transakcje są zawierane bezpośrednio pomiędzy stronami, tj. bez pośrednictwa giełdy.

[6] Rachunek subdepozytowy służy do ewidencji papierów wartościowych i jest prowadzony na rzecz funduszu inwestycyjnego przez subdepozytariusza. Subdepozytariuszem jest podmiot, któremu przekazano wykonywanie czynności z zakresu przechowywania aktywów funduszu.

[7] *Misselling* to proponowanie konsumentom nabycia usług finansowych, które nie odpowiadają potrzebom tych konsumentów ustalonym z uwzględnieniem dostępnych przedsiębiorcy informacji w zakresie cech tych konsumentów lub proponowanie nabycia usług finansowych w sposób nieadekwatny do charakteru tych usług; [NIK 2019].

obligacjami w ogóle, a część inwestorów błędnie utożsamiało bezpieczeństwo tych obligacji (jako instrumentu) z depozytami bankowymi [KNF 2018][8].

Afera Getback SA, pomijając kwestie *missellingu* obligacji czy oszustw księgowych, wywołała także dyskusję na temat konieczności stworzenia wspólnej bazy informacji o papierach dłużnych. Baza taka pozwalałaby weryfikować zadłużenie emitentów, a zwłaszcza to, czy nie rośnie ono w zbyt szybkim tempie. Warto podkreślić, że ani obligatariusze Getback SA ani KNF nie mieli pełnych bieżących informacji o liczbie i zakresie emisji prywatnych[9] papierów wartościowych. Ponadto, z uwagi na brak regulacji, KNF nie była informowana ani o ofertach prywatnych obligacji ani o ich przydziałach [NIK 2019].



Rysunek 1. Formy rejestracji obligacji nieskarbowych po 1 lipca 2019 r.

Źródło: opracowanie własne.

[8] W związku ze skargami nabywców obligacji Getback SA w sprawie *missellingu* i wprowadzania ich w błąd, Komisja Nadzoru Finansowego (KNF) w dniu 29 maja 2018 r. zamieściła komunikat dotyczący oferowania przez banki obligacji korporacyjnych klientom posiadającym środki o wartości nie wyższej niż podlegające ochronie z tytułu gwarantowania depozytów, które w przekonaniu klientów objęte są systemem gwarantowania.

[9] Emisjami prywatnymi nazywano emisje kierowane do maksymalnie 149 inwestorów. Wśród 387 serii obligacji Getback SA aż 262 serie wyemitowano w ramach emisji prywatnych [NIK 2019]. Zgodnie ze stanowiskiem KNF z 12 sierpnia 2019 r. obecnie ofertę prywatną stanowi oferowanie obligacji do 1 podmiotu [KNF 2019].

Po ujawnieniu problemów Getback SA z regulowaniem zobowiązań wobec obligatariuszy rozpoczęto dyskusję nad zwiększeniem zakresu ochrony inwestorów aktywnych na rynku obligacji korporacyjnych, polegającej m.in. na zniesieniu materialnej formy obligacji. Efektem końcowym prac, w których kluczowy udział miał powołany przez Ministra Finansów Zespół Roboczy Rady Rozwoju Rynku Finansowego ds. przeglądu regulacji rynku obligacji korporacyjnych, była tzw. ustawa o wzmocnieniu nadzoru [Dz.U. 2018, poz. 2243 z późn. zm.]. Ustawa ta z dniem 1 lipca 2019 r. wprowadzała m.in. obowiązki:

– rejestracji wszystkich obligacji w KDPW (znosząc formę materialną) – bezpośrednio w KDPW w trybie DvP[10] albo za pośrednictwem agenta emisji, którego rolą jest m.in. weryfikacja spełniania przez emitenta wymogów prawnych dotyczących emisji oraz zgodności dokumentacji i oświadczeń przedstawionych przez emitenta z wymogami dotyczącymi oferowania[11],

– przekazania do KDPW do 31 marca 2020 r. informacji o obligacjach wyemitowanych przed 1 lipca 2019 r. wg stanu na dzień 31 grudnia 2019 r.[12],

– comiesięcznej aktualizacji informacji o zobowiązaniach z obligacji[13].

W celu zwiększenia przejrzystości rynku stworzono więc Rejestr Zobowiązań Emitentów przy KDPW [RZE, dostęp 4.06.2020], który obejmuje niemal wszystkie[14] nieskarbowe papiery dłużne, takie jak obligacje materialne, obligacje zdematerializowane i listy zastawne oraz częściowo certyfikaty inwestycyjne [Dz.U. 2020, poz. 89 z późn. zm., art. 48 ust 5e]. W RZE od 1 kwietnia 2020 r.[15] można już m.in. sprawdzić:

[10] *Delivery versus payment*; chodzi o jednoczesną emisję i rejestrację obligacji w KDPW na podstawie § 5 Szczegółowych Zasad Działania KDPW, pod warunkiem wcześniejszego wprowadzenia obligacji do ASO albo ich dopuszczenia do obrotu na rynku regulowanym [SZD KDPW].

[11] Wg stanu prawnego na dzień 14 czerwca 2020 r. obligacje, w odniesieniu do których emitent nie zamierza ubiegać się o dopuszczenie do obrotu na rynku regulowanym ani o wprowadzenie do ASO, muszą być zarejestrowane w KDPW za pośrednictwem agenta emisji, zgodnie z art. 7a ustawy o obrocie [Dz.U. 2020, poz. 89 z późn. zm.].

[12] Informację o obligacjach (według stanu na 31.12.2019 r.) przekazuje do KDPW ich emitent (w przypadku obligacji materialnych) albo podmiot prowadzący ich ewidencję (w przypadku obligacji zapisanych w ewidencji) [Dz.U. 2018, poz. 2243 z późn. zm., art. 44].

[13] Aby uniknąć tego obowiązku należy zarejestrować papiery w KDPW, jednak wówczas pojawia się wynikający z par. 79 [Regulaminu KDPW] obowiązek informowania KDPW o każdym terminie wypłaty świadczeń z obligacji, a także, zgodnie z par. 80b [Regulaminu KDPW], informować o realizacji tych świadczeń, o ile nastąpiły z pominięciem systemów KDPW.

[14] Do nieskarbowych papierów dłużnych zalicza się również bankowe papiery wartościowe, zwane potocznie certyfikatami depozytowymi, emitowanymi przez banki na podstawie art. 90 ustawy z dnia 29 sierpnia 1997 r. Prawo bankowe [Dz.U. 2019, poz. 2357 z późn. zm.]. Papiery te mogą być nadal rejestrowane w ewidencji (tj. poza KDPW).

[15] Wprawdzie rejestr RZE uruchomiono już 1 lipca 2019 r., ale informacje o papierach wyemitowanych przed 1 lipca 2019 r. znalazły się w nim dopiero po 31 marca 2020 r.

– łączną wartość nominalną obligacji wszystkich emitentów,
– wartość poszcz. serii obligacji wraz z rokiem emisji, datą spłat odsetek i kapitału (kalendarz płatności) oraz wysokością niewykonanych świadczeń,
– miejsce rejestracji obligacji (KDPW albo poza KDPW).

2. KLUCZOWE CECHY RYNKU OBLIGACJI NIESKARBOWYCH WYNIKAJĄCE Z REJESTRU ZOBOWIĄZAŃ EMITENTÓW

Poniższe analizy przeprowadzono w oparciu o plik XML ze strony Rejestru Zobowiązań Emitentów. W tabeli 1 ujęto najważniejsze statystyki polskiego rynku obligacji w ujęciu wartościowym. Łączna wartość nominalna wszystkich niezapadłych obligacji na dzień 30 kwietnia 2020 r. to ponad 203,5 mld PLN, z czego 53,4% zarejestrowano w KDPW. Wśród obligacji poza KDPW[16] wartościowo dominują (76,6%) obligacje emitentów innych niż banki i samorządy – gł. przedsiębiorstw[17]. Wartości nominalne w tabelach to łączne wartości nominalne obligacji danej kategorii, z tym, że wartości w walutach obcych przeliczono po następujących kursach: 4,5 EUR/PLN, 4,15 USD/PLN i 4,3 CHF/PLN.

Tabela 1. Emitenci obligacji wg typu podmiotu oraz miejsca rejestracji – ujęcie wartościowe na dzień 30.04.2020 (obligacje zapadające po 30.04.2020)

Ogółem			w tym w KDPW			w tym poza KDPW		
Typ emitenta	Wartość nom. w tys. PLN	%	Wartość nom. w tys. PLN	%		Wartość nom. w tys. PLN	%	
				KDPW	ogółem		poza KDPW	ogółem
Inni	124 889 203	61,3	52 199 227	48,1	41,8	72 689 976	76,6	58,2
Banki	53 641 778	26,4	51 608 753	47,5	96,2	2 033 025	2,1	3,8
JST	25 037 685	12,3	4 806 200	4,4	19,2	20 231 485	21,3	80,8
SUMA	203 568 667	100,0	108 614 180	100,0	53,4	94 954 486	100,0	46,6

Źródło: opracowanie własne na podstawie RZE, dostęp 4.06.2020.

Tabela 2 zawiera statystyki dotyczące liczby serii obligacji w podziale na typ emitenta i miejsce rejestracji. Łączna liczba serii wszystkich niezapadłych obligacji na dzień 30 kwietnia 2020 r. wynosiła 23 923 sztuki, z czego aż 92,9% zarejestrowano poza KDPW. Najwięcej serii obligacji ogółem wyemitowały samorządy[18] (73,8%) – średnia wartość serii to tylko 1,4 mln PLN. W przypadku

[16] Przypomnijmy, że są to obligacje zapisane w ewidencjach firm inwestycyjnych lub banków albo mające formę dokumentu.

[17] Emitentami są tutaj również fundusze inwestycyjne niebędące przedsiębiorstwami.

[18] W dotychczasowej praktyce samorządy dzieliły konieczny do pozyskania dług na kilka serii zapadających kolejno rok po roku. Dodatkowo mogły też emitować po kilka serii w ciągu roku,

emitentów innych niż banki i JST[19] (głównie przedsiębiorstw) jest to 20,5 mln PLN, a banków aż 255,4 mln PLN. Serie zarejestrowane w KDPW (ok. 64 mln PLN) są istotnie wyższe od tych zarejestrowanych poza KDPW (ok 4,3 mln PLN)[20]. Zdecydowaną większość serii obligacji emitentów innych niż JST i banki (88,3%) oraz samorządów (95,2%) zarejestrowano poza KDPW.

Tabela 2. Emitenci obligacji wg typu podmiotu oraz miejsca rejestracji – ujęcie ilościowe na dzień 30.04.2020 (obligacje zapadające po 30.04.2020)

Ogółem				w tym w KDPW				w tym poza KDPW			
Typ emitenta	Liczba serii	%	Średnia wartość serii w tys. PLN	Liczba serii	%		Średnia wartość serii w tys. PLN	Liczba serii	%		Średnia wartość serii w tys. PLN
					KDPW	ogółem			poza KDPW	ogółem	
Inni	6 086	25,4	20 521	715	42,1	11,7	73 006	5 371	24,2	88,3	13 534
Banki	210	0,9	255 437	131	7,7	62,4	393 960	79	0,4	37,6	25 734
JST	17 627	73,7	1 420	852	50,2	4,8	5 641	16 775	75,5	95,2	1 206
SUMA	23 923	100,0	8 509	1 698	100,0	7,1	63 966	22 225	100,0	92,9	4 272

Źródło: opracowanie własne na podstawie RZE, dostęp 4.06.2020.

Tabela 3. Porównanie źródeł informacji o rynku obligacji nieskarbowych na dzień 30.04.2020 w tys. PLN (obligacje zapadające po 30.04.2020)

Źródło i data danych	Rejestr Zobowiązań Emitentów	Fitch Rating&Rynek	NBP
Typ emitenta	30.04.2020	30.04.2020	30.04.2020
Różni (papiery krótkoterminowe)	n/d	12 798 900	n/d
Inne (gł. przedsiębiorstwa)	124 889 203	70 907 180	85 722 000
Banki z BGK (bez listów zastawnych)	53 641 778	63 857 850	21 580 600
Samorządy (JST)	25 037 685	24 484 590	21 919 000
SUMA w tys. PLN	203 568 667	172 048 520	129 221 600

Źródło: opracowanie własne na podstawie RZE, dostęp 4.06.2020; Fitch Polska 2020; NBP 2020.

w zależności od bieżącego zapotrzebowania. Obecnie, m.in. z uwagi na koszty agenta emisji, KDPW oraz obsługi płatności odsetek przez agenta płatniczego, praktyka ta ewoluuje w kierunku łączenia mniejszych wartościowo serii w większe, ale za to amortyzowane.

[19] Jednostki samorządu terytorialnego.

[20] Konieczność pozyskania większego kapitału przez emitenta naturalnie wymusza rejestrację w centralnym rejestrze dla ułatwienia obrotu i zainteresowania potencjalnych inwestorów instytucjonalnych. Praktyką rynkową jest także „doemitowywanie" (tzw. tap) kolejnych obligacji o tych samych warunkach emisji, które mogą być zapisane w KDPW pod tym samym kodem ISIN jako ta sama seria obligacji (będą podlegać asymilacji), dzięki czemu takie obligacje mogą mieć potencjalnie wyższą płynność, niż gdyby były zarejestrowane jako dwie osobne serie.

Rejestr Zobowiązań Emitentów powinien wg założeń ustawodawcy pokazywać kompletny obraz polskiego rynku obligacji nieskarbowych, dlatego warto porównać go z innymi publicznie dostępnymi statystykami Fitch Polska [Fitch Polska 2020] oraz NBP [NBP 2020]. Efektem tego porównania jest tabela 3.

Najbardziej zbliżone do siebie są wartości obligacji komunalnych (od 22 do 25 mld PLN)[21]. W przypadku papierów bankowych Fitch podaje wyższe wartości niż RZE, ale wynika to głównie z uwzględniania bankowych papierów wartościowych, których w RZE przeważnie nie ma. W przypadku innych emitentów (gł. przedsiębiorstw) RZE podaje znacznie wyższe wartości. Aby zrozumieć te istotne różnice należy zrozumieć założenia metodologiczne raportów Fitch i NBP. Statystyki Fitch[22] powstają na bazie danych przesyłanych przez największe instytucje finansowe plasujące papiery dłużne (dilerzy), dlatego też nie obejmują m.in. danych o obligacjach materialnych wyemitowanych bez udziału dilera. Z kolei raporty NBP powstają na bazie sprawozdań miesięcznych otrzymanych jedynie od panelu banków, dlatego też należy je traktować z pewnym dystansem, choć w przekroju czasowym mogą wskazywać na pewne tendencje zmian w portfelach obligacji poszczególnych grup inwestorów[23].

Skoncentrujemy się teraz wyłącznie na danych z RZE. Biorąc pod uwagę wartość nominalną wyemitowanych obligacji, dwudziestu największych emitentów to ponad połowa (52,4%) całego rynku obligacji nieskarbowych w Polsce (tabela 4). Największymi z nich są BGK oraz PFR SA, a przewaga ta wzrosła dzięki emisjom obligacji COVID[24]. Branżowo w poniższym zestawieniu zdecydowanie dominują instytucje finansowe oraz spółki energetyczne, większość papierów (69,2%) zarejestrowano w KDPW, a przeszło 90% łącznej wartości nominalnej wyemitowały spółki pod kontrolą Skarbu Państwa.

[21] Fitch do emitentów obligacji komunalnych zalicza też spółki komunalne (np. MPWIK).

[22] Oto założenia metodologiczne raportu Rating&Rynek, które częściowo wyjaśniają różnice w stosunku do danych RZE i NBP : 1) podział na obligacje przedsiębiorstw, banków i JST dotyczy papierów o zapadalności powyżej 365 dni, a pozostałe papiery ujęto razem jako krótkoterminowe – ich łączna wartość na 30.04.2020 r. wyniosła 12.798,90 mln PLN; 2) wśród banków ujęto również papiery dłużne niebędące obligacjami (np. bankowe papiery wartościowe); 3) raport zawiera nieliczne obligacje funduszy inwestycyjnych, których w RZE jest więcej; 4) źródłem raportu są dane przekazywane dobrowolnie przez instytucje finansowe, w których zdarzają się błędy polegające np. na nieprawidłowej wartości lub w ogóle braku danej serii obligacji w wykazie; 5) raporty Rating&Rynek zawierają również informacje o wielkości długu uplasowanego przez poszczególnych dilerów, dlatego są podstawowym źródłem informacji o udziałach dilerów w rynku obligacji.

[23] Chodzi np. o instytucje monetarne, fundusze inwestycyjne czy instytucje ubezpieczeniowe.

[24] Jako obligacje COVID rozumiane są specjalne obligacje emitowane po 31 marca 2020 r. przez Bank Gospodarstwa Krajowego oraz Polski Fundusz Rozwoju SA na rzecz Funduszu Przeciwdziałania COVID-19 w oparciu m.in. o ustawę z dnia 27 października 1994 r. o autostradach płatnych oraz o Krajowym Funduszu Drogowym (Dz.U. 2020, poz. 72, 278, 1087 z późn. zm.). Na dzień 4.06.2020 obligacje PFR SA i BGK miały łączną wartość nominalną ponad 92,3 mld PLN, podnosząc wartość całego rynku obligacji nieskarbowych do 259,4 mld PLN. W kolejnych analizach zasadne będzie wyłączenie ze statystyk wszystkich serii obligacji objętych gwarancją Skarbu Państwa, ponieważ *de facto* należy je traktować jak obligacje skarbowe.

Tabela 4. Emitenci z najwyższą wartością nominalną wyemitowanych obligacji na dzień 30.04.2020 (obligacje zapadające po 30.04.2020)

Lp.	Emitent	Liczba serii	Wartość nominalna obligacji w tys. PLN		
			ogółem	w tym KDPW	w tym poza KDPW
1	Bank Gospodarstwa Krajowego	9	**26 570 000**	26 570 000	0
2	Polski Fundusz Rozwoju SA	1	**16 325 000**	16 325 000	0
3	PGE Górnictwo i Energetyka Konwencjonalna SA	17	**10 930 000**	0	10 930 000
4	ENEA SA	20	**7 718 000**	2 000 000	5 718 000
5	Powszechna Kasa Oszczędności Bank Polski SA	3	**6 075 000**	6 075 000	0
6	PKP Polskie Linie Kolejowe SA	4	**3 877 145**	0	3 877 145
7	Santander Bank Polska SA	3	**3 790 000**	3 790 000	0
8	TAURON Polska Energia SA	23	**3 492 300**	1 605 000	1 887 300
9	PKO Bank Hipoteczny SA	11	**3 036 000**	3 036 000	0
10	Bank Polska Kasa Opieki SA	5	**2 750 000**	2 750 000	0
11	CAN-PACK SA	9	**2 658 000**	0	2 658 000
12	ENEA Wytwarzanie Sp. z o.o.	10	**2 650 000**	0	2 650 000
13	Polska Grupa Górnicza SA	15	**2 619 197**	0	2 619 197
14	ENEA OPERATOR Sp. z o.o.	10	**2 486 732**	0	2 486 732
15	Powszechny Zakład Ubezpieczeń SA	1	**2 250 000**	2 250 000	0
16	Alior Bank SA	11	**2 030 200**	1 985 200	45 000
17	KGHM Polska Miedź SA	2	**2 000 000**	2 000 000	0
18	Cyfrowy Polsat SA	2	**2 000 000**	2 000 000	0
19	Bank Millennium SA	3	**1 780 000**	1 780 000	0
20	„PEKAO LEASING" Sp. z o.o.	13	**1 690 000**	1 690 000	0
	SUMA	172	106 727 574	73 856 200	32 871 374

Źródło: opracowanie własne na podstawie RZE, dostęp 4.06.2020.

Tabela 5 ukazuje największych emitentów obligacji pod kątem niespełnionych świadczeń[25]. Na pierwszym miejscu jest Getback SA, który wyemitował aż 307 serii obligacji o średniej łącznej wartości nominalnej zaledwie 7,3 mln PLN[26]. Łączna wartość niespełnionych świadczeń z obligacji dla 20 największych

[25] RZE pokazuje trzy kategorie zobowiązań dla każdej serii obligacji – wartość nominalna emisji, wymagane świadczenia (suma płatności, które powinny już być dokonane) oraz niewykonane świadczenia.

[26] Stosunkowo nieduża średnia wartość serii wynika z tego, że papiery Getbacku oferowano głównie osobom fizycznym w ramach tzw. „pełzających" ofert niepublicznych (tj. jedną serię kierowano do maks. 149 osób).

podmiotów wynosi ponad 3,6 mld PLN, czyli niecałe 2,9% łącznej wartości nominalnej obligacji emitentów innych niż banki i samorządy (gł. przedsiębiorstwa). Wartość wszystkich niespełnionych świadczeń z obligacji wg RZE wynosi prawie 4,8 mld PLN, tj. 2,3% wartości nominalnej wszystkich obligacji.

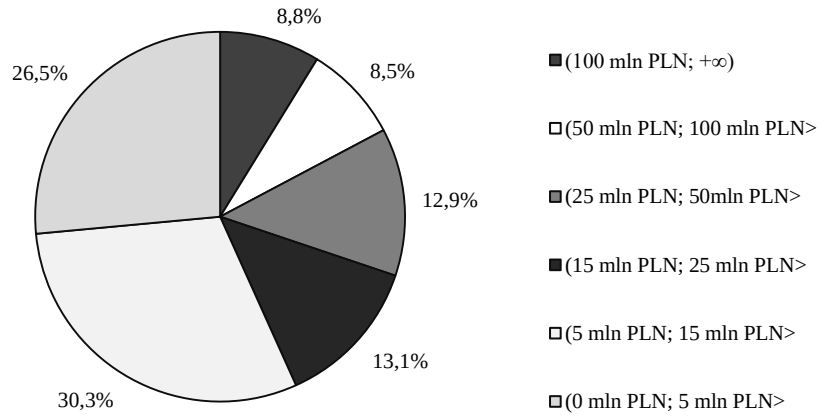
Tabela 5. Emitenci z najwyższą wartością wymaganych i niespełnionych świadczeń z obligacji na dzień 30.04.2020

Lp.	Emitent	Liczba serii	Wartość niespełnionych świadczeń z obligacji w tys. PLN	Wartość nominalna obligacji w tys. PLN[18]		
				ogółem	w tym KDPW	w tym poza KDPW
1	Getback SA w restrukturyzacji	307	2 640 706	2 240 912	545 451	1 695 461
2	Idea Money SA	12	242 450	505 270	0	505 270
3	Gant Development SA	9	127 307	143 932	114 827	29 105
4	PBG SA w restrukturyzacji	11	115 643	1 172 256	338 356	833 900
5	Action SA w restrukturyzacji	1	101 608	100 000	100 000	0
6	Gwarna Wrocław Sp. z o.o.	4	87 450	20 449	0	20 449
7	PCZ SA w upadłości likwidacyjnej	7	73 156	71 690	71 690	0
8	Progres Investment SA w upadłości	2	54 871	50 000	30 000	20 000
9	Debt Factory Sp. z o.o.	31	53 576	34 776	0	34 776
10	Zakłady Mięsne Henryk Kania SA	3	52 651	150 900	150 900	0
11	Atlantic Trust SA	1	49 152	35 000	0	35 000
12	Recykling I Energia SA	1	47 330	36 400	0	36 400
13	Upturn SA	1	40 000	40 000	40 000	0
14	Trust SA	3	39 747	35 683	35 683	0
15	Rubin Energy Sp. z o.o.	2	38 707	38 000	0	38 000
16	Milmex Systemy Komputerowe Sp. z o.o.	5	34 911	33 205	28 135	5 070
17	Lmb Capital SA	4	33 863	33 000	0	33 000
18	Polimex-Mostostal SA	5	33 302	172 650	0	172 650
19	EZO SA	6	32 541	25 500	0	25 500
20	Kerdos Group SA w restrukturyzacji	6	31 154	35 206	31 154	4 052
	SUMA	421	3 930 126	4 974 829	1 486 196	3 488 633

Źródło: opracowanie własne na podstawie RZE, dostęp 4.06.2020.

Na wykresie 1 przedstawiono rozdrobnienie emitentów obligacji. Emitenci, którzy wyemitowali obligacje o łącznej wartości nominalnej min. 100 mln PLN, stanowią zaledwie 8,8% wszystkich emitentów. Oznacza to, że większość

emitentów (56,7%) stanowią spółki, które wyemitowały nie więcej niż 15 mln PLN obligacji, co świadczy o dużym rozdrobnieniu rynku. Warto podkreślić, że najmniejsi emitenci obligacji (tj. emitujący mniej niż 25 mln PLN) znajdują się poza potencjalnym kręgiem zainteresowania inwestorów instytucjonalnych[27].



Wykres 1. Emitenci obligacji (razem 2221 podmiotów) wg udziału w łącznej wartości nominalnej wyemitowanych obligacji na dzień 30.04.2020 (obligacje zapadające po 30.04.2020)

Źródło: opracowanie własne na podstawie RZE, dostęp 4.06.2020.

Z RZE wynika także, że wśród obligacji wyemitowanych do końca 2019 r. i zapadających po 30 kwietnia 2020 r., tylko ok. 11,5% serii obligacji (w ujęciu wartościowym ok. 20%) posiada stałe oprocentowanie[28]. Zdecydowana większość obligacji nieskarbowych na polskim rynku (z wyłączeniem stałokuponowych obligacji COVID emitowanych przez BGK i PFR SA) posiada zmienne oprocentowanie oparte o odpowiedni indeks WIBOR. W rejestrze RZE nie znajdziemy niestety m.in. informacji o wysokości zmiennej marży, kowenantach, zabezpieczeniach, ani też o wartości pozostającego aktualnie do spłaty kapitału, jeżeli obligacje są amortyzowane[29]. Wysokość kuponu można policzyć, dzieląc wartość ostatnio wypłaconych odsetek przez nominał serii z uwzględnieniem

[27] Po pierwsze, instytucje finansowe muszą przestrzegać limitów zaangażowania w danym podmiocie (np. max 20% emisji). Po drugie, zbyt mała kwota inwestycji jest nieefektywna z punktu widzenia operacyjnego, m.in. z uwagi na konieczność przeprowadzenia analiz, wyliczeń ratingu, akceptacji komitetów inwestycyjnych itp.

[28] W arkuszu XML za zmienny kupon uznano wartość oprocentowania równą 0.

[29] Szczegółowe warunki emisji obligacji notowanych na Catalyst są dostępne w formie not informacyjnych na stronie GPW Catalyst [www1, dostęp 4.06.2020].

częstotliwości wypłaty (głównie kwartalnej lub półrocznej), a następnie od wartości kuponu odjąć odpowiednią wartość indeksu WIBOR[30].

Mimo pewnych ograniczeń i dostrzeżonych błędów, dzięki RZE można wreszcie poznać pełniejszy i przede wszystkim publicznie dostępny obraz polskiego rynku obligacji nieskarbowych[31]. Wybrane informacje o papierach, które wcześniej były „rozproszone" w wielu różnych rejestrach, zebrano wreszcie w jednym miejscu. Na pierwszy rzut oka wydaje się, że surowa informacja o łącznym zadłużeniu danego emitenta (wynikającym z obligacji) niewiele mówi o jego sytuacji finansowej, jeśli nie odniesie się jej np. do sumy bilansowej. Informacja ta z pewnością jest przydatna dla zarządzających funduszami inwestycyjnymi, którzy nabywając papiery dłużne muszą przestrzegać limitów zaangażowania w danym emitencie[32].

Spójny rejestr obligacji ma także niebagatelne znaczenie z punktu widzenia nadzoru nad rynkiem, gdyż pozwala Komisji Nadzoru Finansowego na poznanie skali zadłużenia oraz przeprowadzenie „punktowej" kontroli, zarówno u emitenta, jak i u agenta emisji, który dany papier zarejestrował. Warto podkreślić, że wprowadzenie instytucji agenta emisji teoretycznie poprawiło bezpieczeństwo rynku i „sprofesjonalizowało" emisje obligacji m.in. dzięki weryfikacji ustawowych wymogów w zakresie trybu oferowania długu i informacji udostępnianych przez emitenta (np. czy obligacje powinny być oferowane w oparciu o prospekt emisyjny zatwierdzany przez KNF).

Oczywiście pamiętajmy, że żaden, nawet najdokładniejszy rejestr, nie stanowi skutecznej bariery dla przestępczości finansowej i *missellingu*. Łatwo zauważyć, że w celu ukrycia łącznej wartości zadłużenia z tytułu obligacji, spółka może emitować dług pośrednio poprzez spółki córki mające zupełnie inne nazwy. Ponadto należy pamiętać o ryzyku nieprzekazania lub przekazania błędnych/niepełnych danych przez agenta emisji lub agenta płatniczego lub przez samego emitenta do RZE, mimo iż grozi za to kara grzywny do 2 mln PLN[33].

[30] O rentowności papieru prócz kuponu decyduje też jego cena. Przykładowo, obligacje mogą być emitowane z niskim kuponem, ale z dużym dyskontem do wartości nominalnej. W ten sposób realny koszt dla emitenta obligacji jest „przesuwany" w kierunku zapadalności.

[31] Innym cennym źródłem informacji o polskim rynku papierów dłużnych są miesięczne raporty „Rating&Rynek", które powstają na bazie informacji przekazywanej agencji Fitch Ratings przez instytucje oferujące obligacje.

[32] Przykładowo, zgodnie z art. 96 ust. 1 ustawy z dnia 27 maja 2004 r. o funduszach inwestycyjnych i zarządzaniu alternatywnymi funduszami inwestycyjnymi [Dz.U. 2020, poz. 95, 695 z późn. zm.], fundusz inwestycyjny otwarty nie może lokować więcej niż 5% wartości swoich aktywów w papiery wartościowe wyemitowane przez jeden podmiot.

[33] Art. 178c ustawy o obrocie [Dz.U. 2020, poz. 89 z późn. zm.].

3. KLUCZOWE CECHY RYNKU OBLIGACJI KOMUNALNYCH

Wśród obligacji nieskarbowych na szczególną uwagę zasługują obligacje komunalne. Dla samorządów są one atrakcyjnym substytutem kredytu bankowego. Emisja obligacji nie wymaga przeprowadzenia sformalizowanego przetargu wedle przepisów Ustawy o finansach publicznych[34]. Ponadto każdej serii obligacji, różniących się od siebie nie tylko wartością nominalną, ale także dniem emisji i wykupu, można przypisać różną marżę, obniżając w ten sposób średni koszt finansowania mierzony wewnętrzną stopą zwrotu (IRR)[35].

Dla inwestorów indywidualnych obligacje komunalne są praktycznie niedostępne, ponieważ większość z nich tuż po emisji trafia na stałe do portfeli kredytowych[36] banków[37], dla których są atrakcyjnym aktywem pod kątem ryzyka. Samorządy nie mogą formalnie upaść i reprezentują nieco wyższy poziom ryzyka kredytowego niż obligacje skarbowe, obciążając kapitały banków tylko w 20%[38]. Z tego powodu banki rzadko sprzedają obligacje komunalne, dlatego zmienność ich cen jest niższa niż cen obligacji skarbowych.

Większość rzadkich transakcji obligacjami komunalnymi odbywa się na pozagiełdowym rynku OTC (tak jak w przypadku innych obligacji nieskarbowych[39]), dlatego też zupełnie traci na znaczeniu najważniejsza cecha obligacji komunalnych jako papieru wartościowego, czyli ich zbywalność. Wprawdzie kilkanaście serii komunalnych jest notowanych na Catalyst, jednak obrót nimi jest bardzo niewielki. Celem wprowadzenia tych papierów na rynek regulowany było w zasadzie jedynie obniżenie kosztów płynności przez banki będące ich obligatariuszami[40]. Z tego powodu stworzenie platformy Catalyst niewiele przyczyniło się do rozwoju samorządowego rynku papierów wartościowych [Hajdys 2019: 16–32]. W praktyce jedyną szansą dla inwestora indywidualnego na zakup długu samorządowego jest zakup

[34] Wynika to z art. 11 ust. 1 pkt 7 Ustawy z dnia 29 stycznia 2004 r. – Prawo zamówień publicznych [Dz.U. 2019, poz. 1843]. Samorządy organizują konkursy na organizację emisji i nabycie obligacji, ale warunki tych konkursów mogą kształtować w dowolny sposób. Przeważnie JST są tu wspierane przez wyspecjalizowane firmy doradcze, a do konkursów zaprasza się banki.

[35] Dla amortyzowanego kredytu stworzenie „szarpanej", rosnącej marży jest trudne.

[36] Zgodnie ze standardem IFRS9 portfelami kredytowymi nazywa się portfele *hold to collect*, w których papiery są zasadniczo trzymane aż do zapadalności; wycena takich portfeli dokonywana jest za pomocą efektywnej stopy procentowej przy stałej wartości nominalnej; zob. www2, dostęp 4.06.2020.

[37] Według NBP w portfelach banków na 30 kwietnia 2020 r. znajdowało się niecałe 89% obligacji komunalnych – www3, dostęp 4.06.2020.

[38] Chodzi o wartość aktywów ważonych ryzykiem (RWA, *risk weighted assets*), używaną do obliczania współczynnika wypłacalności Banku zgodnie z Rozporządzeniem CRR 575/2013.

[39] Inwestorzy instytucjonalni preferują handel papierami dłużnymi na rynku OTC m.in. z uwagi na niższe koszty transakcyjne oraz możliwość nie wpływania na cenę rynkową.

[40] Obligacje komunalne o wartości nominalnej przekraczającej 10 mln PLN mogą być uznane przez NBP jako zabezpieczenie w transakcjach typu repo, co pozwala bankom obligatariuszom na obniżenie kosztu płynności związanego z posiadaniem tych obligacji.

jednostek uczestnictwa funduszy inwestycyjnych, który ma silną ekspozycję na sektor samorządowy. Jest to jednak niszowa kategoria aktywów, ponieważ na dzień 14.06.2020 istniał tylko jeden otwarty subfundusz, który statutowo inwestował co najmniej 50% swoich aktywów netto w obligacje municypalne [Pekao Obligacji Samorządowych]. Sposobami na zwiększenie dostępności obligacji komunalnych dla inwestorów indywidualnych mogłyby być ich aktywne oferowanie na rynku wtórnym przez banki, a także m.in. zwiększenie wielkości ich serii oraz zwiększenie skali animacji (obecnie jest ona dobrowolna).

W przeciwieństwie do papierów skarbowych, od lutego 2016 r. banki muszą płacić od obligacji municypalnych „podatek bankowy”[41], który *de facto* (podobnie jak przy kredytach) zwiększa koszty udzielenia kredytu i podnosi marżę odsetkową. W organizowanych przez samorządy konkursach na finansowanie w formie obligacji, duże banki komercyjne przegrywają z małymi bankami spółdzielczymi, reprezentowanymi przez zrzeszający je Bank Polskiej Spółdzieczości SA, oraz z Bankiem Gospodarstwa Krajowego, które podatku płacić nie muszą[42]. Co więcej, BGK wykorzystuje również swoją uprzywilejowaną „kosztową” pozycję na rynku kredytowym, gdzie aktywnie oferuje finansowanie przedsiębiorstwom komercyjnym.

Wspomniana przewaga BGK może w dłuższym terminie doprowadzić do spadku zainteresowania banków komercyjnych długoterminowym inwestowaniem w obligacje samorządowe. Z jednej strony może to osłabić konkurencję i doprowadzić do wzrostu marż obligacji komunalnych, ale z drugiej zaś strony może zmusić banki do poszukiwania innych inwestorów na rynku wtórnym, dla których obligacje samorządowe będą aktywem bardziej atrakcyjnym pod kątem rentowności (np. fundusze inwestycyjne).

4. ZASTRZEŻENIA DOTYCZĄCE DANYCH W REJESTRZE ZOBOWIĄZAŃ EMITENTÓW

Podczas analizy rejestru zobowiązań emitentów dostrzeżono pewne cechy i błędy, których uwypuklenie jest istotne pod kątem przyszłych badań nad rynkiem obligacji nieskarbowych, jak i usprawnień samego rejestru. Oto one:

– brak informacji o dokładnej formie obligacji ewidencjonowanych poza KDPW, w tym brak możliwości ustalenia wartości obligacji materialnych;

[41] Jest to efektywnie 0,54% w skali roku [Martysz i Bartlewski 2018: 101–133].

[42] W przypadku banków spółdzielczych wynika to z sumy bilansowej niższej niż 4 mld PLN, natomiast podatek w ogóle nie dotyczy BGK. Ponadto, w przeciwieństwie do banków komercyjnych, BGK nie musi również ponosić kosztów wynikających z ustawy z dnia 10 czerwca 2016 r. o Bankowym Funduszu Gwarancyjnym, systemie gwarantowania depozytów oraz przymusowej restrukturyzacji [Dz.U. 2020, poz. 842 z późn. zm.].

– dla kilku niezapadłych obligacji łączna wartość nominalna serii wynosi 0 PLN, co może nieznacznie zaburzać wyniki badań;

– niektóre wykupione papiery mają wartość nominalną zero, a niektóre nie;

– zaległości z tytułu obligacji mogą wynikać nie tyle z braku faktycznej zapłaty za odsetki czy kapitał, co z błędu emitenta lub agenta płatniczego, który nie zarejestrował w KDPW informacji o wykonanych płatnościach[43];

– do tabeli 5 należałoby dodać 80 mln PLN niewykupionych obligacji 5 spółek WI Inwestycje Selektywne; wg rejestru wartość, zarówno wykonanych, jak i niespełnionych świadczeń z tych obligacji wynosi 0 PLN;

– w przypadku kilkudziesięciu serii obligacji o tych samych cechach (m.in. wartość nominalna, skrócona nazwa i zapadalność) trudno jednoznacznie ustalić, czy są to błędne dublety czy dodatkowe emisje o tym samym oznaczeniu.

PODSUMOWANIE

Pokłosiem afery Getback była gruntowna reforma prawa polskiego rynku obligacji nieskarbowych. Dzięki obowiązkowej rejestracji obligacji w KDPW oraz stworzeniu publicznie dostępnego Rejestru Zobowiązań Emitentów [RZE, dostęp 4.06.2020] ułatwiono obrót obligacjami na rynku wtórnym oraz poprawiono przejrzystość rynku. Nowa instytucja agenta emisji poprawiła bezpieczeństwo rynku obligacji m.in. dzięki weryfikacji wymogów prawnych dotyczących emitetna i trybu oferowania obligacji. RZE pozwala nie tylko sprawdzić skalę i terminowość obsługi obligacyjnego zadłużenia emitentów, ale jest również pierwszym publicznie dostępnym narzędziem służącym do kompleksowej analizy polskiego rynku obligacji nieskarbowych.

Rejestr Zobowiązań Emitentów ujawnił wiele cech rynku obligacji, takich jak m.in. duże rozdrobnienie emitentów, niewielkie i liczne serie obligacji samorządowych, dominację emitentów kontrolowanych przez Skarb Państwa, przewagę obligacji o zmiennym oprocentowaniu oraz to, że obligacje zarejestrowane w KDPW to zaledwie połowa rynku obligacji nieskarbowych, choć udział ten będzie długoterminowo zmierzał do 100% (z uwagi na obowiązek rejestracyjny). RZE pokazał także skalę niedostępnego dla inwestora indywidualnego rynku obligacji komunalnych, którego obecnymi uczestnikami są niemal wyłącznie banki i instytucje finansowe.

[43] Płatności odsetkowe i spłaty kapitału mogą być dokonywane poza KDPW (tj. bezpośrednio na rachunki obligatariuszy), jednak w takim przypadku, zgodnie z par. 80b [Regulaminu KDPW], konieczne jest potwierdzenie w aplikacji internetowej KDPW, że płatność faktycznie nastąpiła.

Na zakończenie warto dodać, że otoczenie niskich stóp procentowych[44] w dłuższym terminie zmusi inwestorów do poszukiwania wyższych marż i będzie sprzyjać rozwojowi obligacji nieskarbowych. Biorąc pod uwagę rosnące koszty finansowania kredytowego banków można przypuszczać, że przedsiębiorstwa o dobrej sytuacji finansowej będą chętniej emitowały obligacje z myślą o rynku Catalyst, o ile zaakceptują dodatkowe obowiązki informacyjne.

BIBLIOGRAFIA

Fitch Polska, 2020, *Rating&Rynek*, 31.03.2020, https://www.fitchratings.com/research/pl/international-public-finance/rating-rynek-03-2020-27-05-2020 [dostęp 4.06.2020].

Getback SA, 2017, *Raport bieżący EBI 39/2017 z dnia 7 kwietnia 2017 r.*, https://www.getbacksa.pl/relacje-inwestorskie/raporty-biezace/raporty-biezace-ebi [dostęp 4.06.2020].

Getback SA, 2018, *Raport bieżący ESPI 60/2018 z dnia 2 maja 2018 r.*, https://www.getbacksa.pl/relacje-inwestorskie/raporty-biezace/raporty-biezace-espi [dostęp 4.06.2020].

Hajdys D., 2019, *Architektura rynku obligacji komunalnych w Polsce w świetle obowiązujących przepisów prawa*, „Finanse Komunalne", nr 3.

Komisja Nadzoru Finansowego (KNF), 2018, *Komunikat KNF w sprawie oferowania obligacji z 29 maja 2018 r.*, https://www.knf.gov.pl/knf/pl/komponenty/img/Komunikat_KNF_ws_oferowania_ obligacji_61922.pdf [dostęp 4.06.2020].

Komisja Nadzoru Finansowego (KNF), 2019, *Zaktualizowane stanowisko UKNF (...) z dnia 12 sierpnia 2019* r., https://www.knf.gov.pl/knf/pl/komponenty/img/Komunikat_dot_rozporza-dzenia_prospektowego_12-08-2019_66779.pdf [dostęp 4.06.2020].

Krajowy Depozyt Papierów Wartościowych (KDPW), Regulamin KDPW, http://www.kdpw.pl/pl/Regulacje/Strony/regulacje.aspx [dostęp 4.06.2020].

Martysz C., Bartlewski B., 2018, *Podatek bankowy – koncepcja europejska i studium przypadków wybranych krajów UE*, „Studia BAS", nr 1(53), Nowa architektura europejskiego systemu finansowego, Biuro Analiz Sejmowych.

Najwyższa Izba Kontroli (NIK), 2019, *Działalność organów i instytucji państwowych oraz podmiotów organizujących rynek finansowy wobec spółki Getback SA, podmiotów oferujących jej papiery wartościowe oraz ją audytujących, Informacja o wynikach kontroli*, https://www.nik.gov.pl/plik/id,21685,vp,24335.pdf [dostęp 4.06.2020].

Narodowy Bank Polski (NBP), 2020, *Nieskarbowe dłużne papiery wartościowe*, https://www.nbp.pl/home.aspx?f=/statystyka/dealerska/dealerska.htm [dostęp 4.06.2020].

Pekao Obligacji Samorządowych, statut funduszu, https://pekaotfi.pl/produkty/fundusze-inwestycyjne/pekao-obligacji-samorzadowych [dostęp 4.06.2020].

Rejestr Zobowiązań Emitentów [RZE], https://rze.info/ [dostęp 4.06.2020].

Ustawa z dnia 27 października 1994 r. o autostradach płatnych oraz o Krajowym Funduszu Drogowym, Dz.U. 2020, poz. 72, 278, 1087 z późn. zm.

Ustawa z dnia 29 sierpnia 1997 r. – Prawo bankowe, Dz.U. 2019, poz. 2357 z późn. zm.

Ustawa z dnia 9 września 2000 r. o podatku od czynności cywilnoprawnych, Dz.U. 2020, poz. 815 z późn zm.

Ustawa z dnia 29 stycznia 2004 r. – Prawo zamówień publicznych, Dz.U. 2019, poz. 1843.

[44] Od 29 maja 2020 r. stopa referencyjna NBP wynosi 0,10%. Do dnia 17 marca 2020 r. stopa referencyjna NBP przez ponad 5 lat wynosiła 1,50%.

Ustawa z dnia 27 maja 2004 r. o funduszach inwestycyjnych i zarządzaniu alternatywnymi funduszami inwestycyjnymi, Dz.U. 2020, poz. 95, 695 z późn. zm.
Ustawa z dnia 29 lipca 2005 r. o obrocie instrumentami finansowymi, Dz.U. 2020, poz. 89 z późn. zm.
Ustawa z dnia 15 stycznia 2015 r. o obligacjach, Dz.U. 2015, poz. 238 z późn. zm.
Ustawy z dnia 10 czerwca 2016 r. o Bankowym Funduszu Gwarancyjnym, systemie gwarantowania depozytów oraz przymusowej restrukturyzacji, Dz.U. 2020, poz. 842 z późn. zm.
Ustawa z dnia 9 listopada 2018 r. o zmianie niektórych ustaw w związku ze wzmocnieniem nadzoru nad rynkiem finansowym oraz ochrony inwestorów na tym rynku, Dz.U. 2018, poz. 2243 z późn. zm.
[www1] https://gpwcatalyst.pl/emitenci-obligacji-dokumenty-firmy [dostęp 4.06.2020].
[www2] https://www.grantthornton.global/globalassets/1.-member-firms/global/insights/article-pdfs/ifrs/gti-get-ready-ifrs-9-issue-1-classifying-and-measuring-financial-instruments-upd.pdf [dostęp 4.06.2020].
[www3] https://www.nbp.pl/home.aspx?f=/statystyka/dealerska/dealerska.htm [dostęp 4.06.2020].

POLISH NON-TREASURY BOND MARKET – NEW BOND REGISTRATION RULES AND ANALYSIS OF THE BOND ISSUERS' REGISTER

Abstract

After the Getback SA scam, a special Bond Issuers' Register (RZE) was created to strengthen market supervision, which makes it easier for investors to search for information on debt securities. Thanks to this register, we can finally learn about the actual size and several important features of the Polish non-Treasury debt securities market. The first objective of the article is to show significant changes in the law concerning the form of registration of bonds and their potential impact on further market development. The second goal is to show the previously unknown scale and main features of the bond market, including in particular municipal bonds.

The first hypothesis is that the obligatory registration of bonds in KDPW together with the publicly available Bond Issuers' Register (RZE) have improved the transparency and security level of the Polish non-treasury bond market and facilitated trading in these securities on the secondary market. The second hypothesis is that the Bond Issuers' Register is the first publicly available tool for a comprehensive analysis of the Polish non-treasury bond market, which revealed, among other things, the high fragmentation of issuers (especially in local government bonds), the dominance of state-controlled issuers, the predominance of floating rate bonds and significant size of the bond market registered outside KDPW.

Keywords: non-treasury bonds, municipal bonds, debt securities, bond register, bond issuers' register.

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PANDEMIA CZY WOJNA POKOLEŃ?

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Streszczenie

Artykuł dotyczy pandemii koronawirusa COVID-19 i jego potencjalnego wpływu na gospodarkę, system finansów publicznych oraz finanse osobiste. Szok związany z wybuchem i ekspansją wirusa w skali globalnej stawia przez gospodarkami, finansami publicznymi i systemami zdrowotnymi ogromne wyzwania związane z groźbą recesji, drastycznego zmniejszenia dochodów osobistych w gospodarstwach domowych, konieczność opracowania programów rządowych, łagodzących skutki pandemii oraz włączenia się Banku Centralnego w postaci obniżki stóp procentowych i stopy rezerwy obowiązkowej, a także uruchomienia niestandardowych instrumentów polityki monetarnej tzw. luzowania ilościowego (QE). Celem opracowania jest zaproponowanie języka nanofinansów do opisania pandemii jako destrukcji mechanizmu solidarności międzypokoleniowej i wewnątrzpokoleniowej. Główną hipotezą badania jest, że jakość zarządzania ryzykiem finansowym codzienności przesądzi o skali strat finansowych oraz czasie niezbędnym do wyjścia z załamania społeczno-gospodarczego wywołanego pandemią.

Słowa kluczowe: pandemia COVID-19, finanse osobiste, zarządzanie kryzysowe, nanofinanse.

JEL Class: I18, K36, D14, H12.

WSTĘP

Zaraza jest jedną z form urzeczywistnienia się ryzyka systemu zdrowotnego, zdrowia publicznego. Dotychczasowa wiedza o zarządzaniu ryzykiem systemowym wskazuje, że ma ono wyraźne etapy. Pierwszy z nich to poszukiwanie analogii do znanych z przeszłości epidemii. Formalna nazwa koronawirusa SARS-CoV-2 nawiązuje do epidemii SARS. Wiemy, że była to zaraza, która sama po 18 miesiącach wyczerpała zdolność do ekspansji i tli się jako MERS na Półwyspie Arabskim. Tego typu identyfikacja ryzyka systemowego łatwo prowadzi do błędu poznawczego. Zło przychodzi z zewnątrz i pełna izolacja od zewnętrznych kontaktów sprawę rozwiąże.

Drugi etap to pomiar tak zdefiniowanego ryzyka. Standardową metodą pomiaru ryzyka jest metoda Value at Risk. Współcześnie zostaje ona wzbogacona o metodę ***czarnego łabędzia***, pomiaru szkód, które wyrządza zjawisko bardzo mało prawdopodobne – pandemia COVID-19, lecz obejmujące całą ludzkość. Zgodnie z dorobkiem nanofinansów straty tej zarazy polegają na zablokowaniu transferów międzypokoleniowych, co paraliżuje funkcjonowanie rodziny. Są one ogromne, bo rodziny dysponują ogromnymi zasobami majątkowymi. Oficjalne metody wyceny strat z powodu pandemii w 95% odnoszą się do wyceny kosztu śmierci 7 milionów ludzi, co oznacza utratę od 3,5 do 4% GNI (Światowego Produktu). Przy umiarkowanej pandemii 40% strat to utracone zarobki (0,4 do 1% GNI) [Fan i in. 2016].

Dolegliwość pandemii mierzy się przy pomocy dolegliwości dla systemu publicznej służby zdrowia. Gdy zarażony jest 1% ludności, to jest poważne wyzwanie dla systemu zdrowia publicznego. Przy 10% zarażonej ludności infrastruktura kadrowa i finansowa systemu zdrowotnego się rozpada i nie jest zdolna do pełnienia swoich funkcji zapewnienia bezpieczeństwa zdrowotnego kraju [Atkeson 2020].

Trzeci etap to walka o to, kto zapłaci za szkody poczynione przez pandemię koronawirusa? Trwa przesuwanie napięć z finansów publicznych na rynek pracy oraz płynności finansowej publicznych systemów emerytalnych oraz gospodarstw domowych.

Celem opracowania jest zaproponowanie języka nanofinansów do opisania pandemii jako destrukcji mechanizmu solidarności międzypokoleniowej i wewnątrzpokoleniowej. Główną hipotezą badania jest wykazanie, że jakość zarządzania ryzykiem finansowym codzienności przesądzi o skali strat finansowych oraz czasie niezbędnym do wyjścia z załamania społeczno-gospodarczego wywołanego pandemią.

1. POZNAWCZA PERSPEKTYWA ZARZĄDZANIA PANDEMIĄ

Nauki społeczne definiują chorobę jako brak zdrowia. W tej perspektywie pandemia jest wynikiem naruszenia pewnych norm społecznych. Jedną z nich jest przekonanie, że za bezpieczeństwo ekonomiczne i zdrowotne odpowiada państwo. Inną, że zdrowy styl życia jest obowiązkiem obywatela.

W powszechnej świadomości, pandemia koronawirusa jest wynikiem działania ludzi bogatych. Starzy stanowią większość pasażerów statków wycieczkowych, a one stały się rozsadnikiem epidemii. Młodzi włóczą się po świecie i stykają się z nieznanymi krajowej służbie zdrowia chorobami.

Tabela 1 przedstawia grupy obwiniane jawnie i skrycie przez większość obywateli o rozpowszechnianie koronawirusa.

Tabela 1. Grupy naruszające normy zdrowia publicznego

Pandemia	Starzy	Młodzi
Bogaci	Chciwi	Egoiści
Biedni	Wykluczeni	Niedostosowani

Źródło: opracowanie własne.

Pogoń za przygodą w ciepłych krajach powoduje, że choroby są rozwlekane przez statki wycieczkowe i samoloty czarterowe. Młodzi chcieli jeździć na nartach we Włoszech i oglądać mecze piłkarskie w Hiszpanii i stali się ogniskami epidemii, tak samo jak wielotysięczne spotkanie sekty religijnej w Seulu.

Biedni są nosicielami zarazy jedynie wówczas, kiedy mają bezpośredni kontakt z innymi ludźmi.

W modelu wyjaśniania rozpowszechnienia epidemii COVID-19 zasadnicze znaczenie ma fakt, że niekontrolowane rozpowszechnienie zarazy prowadzi do podwojenia liczny osób zarażonych co 4 do 7 dni. Zachowanie ***dystansu społecznego*** powoduje, że liczba osób zarażonych w danym okresie mieści się w zdolności ich hospitalizowania przez służbę zdrowia, zarówno prywatną, jak i publiczną. Zbyt wczesne zniesienie restrykcji sanitarno-epidemiologicznych może spowodować powstanie kolejnej fali pandemii [Anderson i inni 2020].

Ryzyko epidemiologicznie nieracjonalnego zmiękczenia lub zniesienia zasad zachowania dystansu społecznego wynika z presji młodych na odzyskanie płynności finansowej. Podstawowym kanałem jej utrzymania są transfery od dziadków. Pomocniczym kanałem zarządzania płynnością finansową młodych są lombardy i zastawianie smartfonów.

2. METODY WALKI Z PANDEMIĄ

Podobnie jak istnieją mity na temat tego, kto wywołał pandemie, tak istnieją stereotypy jak należy pokonać jej społeczno-ekonomiczne następstwa. Recepta jest prosta, po pierwsze pieniądze, po drugie pieniądze i po trzecie pieniądze.

Tabela 2 zawiera przegląd proponowanych metod walk z pandemią. Zostały one zróżnicowane z punktu widzenia przewidywanej długości występowania pandemii. Jeśli mieści się w okresie do trzech miesięcy to jest rozwiązywana metodami emocjonalnymi, mobilizacją społeczną i solidarnością pobudzoną przez strach o istnienie. Jest to znany w literaturze System I. W przypadku przedłużenia się trwania pandemii uruchamia się System II, zimnej i racjonalnej kalkulacji, ustalania nowych zasad gry społecznej.

Tabela 2. Zarządzanie systemowe ryzykiem koronawirusa

Pandemia – cel przetrwanie	System I (do 3 m)	System II (do 18 m)
Generowanie pieniędzy	Publiczny – elektronicznych pieniędzy NBP	Prywatnych – elektronicznych pieniędzy niebankowych pośredników finansowych
SME	Zwolnienie z danin publicznych	Zmiany strukturalne (sektory: realne – wirtualne)
Wiarygodności kredytowej kraju	Utrzymanie potencjału rozwojowego	Nowa specjalizacja międzynarodowa Polski
Przetrwania rodu	Płynność finansowa rodziny	Sprawiedliwe transfery międzypokoleniowe

Źródło: opracowanie własne.

Panuje powszechne, błędne przekonanie, że wirus przenosi się za pomocą gotówki i bilonu [Auer i in. 2020]. W praktyce Chin banknoty były sterylizowane przed ponownym dopuszczeniem do obrotu pieniężnego. Trwają intensywne prace nad emisją detalicznych pieniędzy elektronicznych emitowanych przez Banki Centralne, m.in. na podstawie rachunków indywidualnych w Banku Centralnym. Dla potencjalnych użytkowników elektronicznych pieniędzy emitowanych przez bank centralny, kluczowy jest koszt transakcyjny tego nowego instrumentu płatniczego. Szacunki Banku Centralnego Kanady mówią, że użytkownik tego pieniądza zyskałby od 0,60 do 1,63 CAD miesięcznie po wprowadzeniu tego typu pieniądza opartego o technologię blockchain [Huynhc i in. 2020].

3. WPŁYW PANDEMII NA FINANSE GOSPODARSTW DOMOWYCH – PRÓBA OCENY

Pierwsze dane dotyczące konsumpcji przez gospodarstwa domowe w 3 i 4 tygodniu marca 2020 r. w Polsce, czyli po wprowadzeniu przez rząd restrykcyjnych ograniczeń związanych z epidemią (zamknięte zostały m.in. sklepy w galeriach, restauracje, kina) wskazują na jej zmniejszenie w stosunku do 3 i 4 tygodnia lutego 2019 r. o ok. 30%, a efekt kupowania „na zapas" nie jest widoczny. Ostatnie 2 tygodnie marca 2020 r. oznaczają ziszczenie się czarnego scenariusza dla Amerykanów, którzy lawinowo tracą pracę – liczba nowych osób bez pracy zwiększyła się z 282 tys. osób w tygodniu przed wybuchem pandemii, poprzez 3,3 mln osób w pierwszym tygodniu, 6,6 mln osób w drugim tygodniu pandemii i 6,7 mln osób w trzecim tygodniu pandemii. Zaledwie w ciągu 21 dni liczba Amerykanów bez pracy zwiększyła się do blisko 17 mln osób, czyli 10% amerykańskiego rynku pracy. Uchwalony przez Kongres plan pomocy gospodarce opiewa na kwotę ponad 2 bln USD. Państwa G-20 przeznaczyły natomiast 5 bln USD na ratowanie światowej gospodarki przed skutkami pandemii COVID-19. W gospodarstwach domowych, pozostających w dobrowolnej lub przymusowej kwarantannie i pracujących zdalnie, maleje zapotrzebowanie na paliwa, przy spadającej jego cenie w związku z sytuacją na rynku ropy naftowej. Pandemia koronawirusa poważnie zaczyna nadszarpywać budżety gospodarstw domowych, a także obnaża negatywne konsekwencje braku planowania i kontrolowania budżetów oraz tworzenia rezerw i oszczędności buforowych, które można byłoby wykorzystać w okresie kryzysu. Wskazuje również na deficyty w zarządzaniu ryzykiem codzienności przez polskie gospodarstwa domowe w okresie prosperity. Wpływ pandemii na poszczególne gospodarstwa domowe i ich finanse nie będzie jednakowy, a determinantami różnicującymi będą zapewne branża zatrudnienia, rodzaj zatrudnienia (etat, własna działalność gospodarcza), liczba osób w gospodarstwie, średni poziom wynagrodzeń, status rodzinny. Ponadto inwestorzy indywidualni posiadający lokaty kapitału na giełdzie również realizują straty w związku z historycznie najniższymi notowaniami walorów na rynku publicznym, odzwierciedlonych w indeksach koniunktury giełdowej.

Negatywnymi konsekwencjami utraty pracy lub obniżenia zarobków dotknięte będą całe gospodarstwa domowe osób pracujących w działach szczególnie narażonych na kryzys. Odrębną kwestią jest wykluczenie w zakresie edukacji prowadzonej zdalnie przez uczniów nieposiadających dostępu do internetu lub wystarczającej liczby komputerów w domu, gdy rodzice pracują zdalnie, a rodzeństwo ma obowiązek zdalnej nauki. To rodzi ryzyka i napięcia w zakresie korzystania z pomocy społecznej i funduszy publicznych dla łagodzenia negatywnego wpływu pandemii. Często rodzice na emeryturze będą utrzymywać niepracujące dzieci, co oznacza transfery międzypokoleniowe między nimi.

Tabela 3. Ryzyko finansowe w gospodarstwach domowych w wyniku pierwszej fali konsekwencji gospodarczych pandemii COVID-19 według kategorii miejsca zamieszkania

Grupa ryzyka	Miasta – liczba mieszkańców w tys.					Wieś
	Powyżej 500	200–500	100–200	20–100	0–20	
Wszystkie gospodarstwa domowe						
Pracujący na umowę o pracę w działach szczególnie zagrożonych						
Odsetek gospodarstw domowych (%)	12,37	12,75	13,05	12,44	11,72	11,04
Pracujący z inną umową lub samozatrudnieni w działach szczególnie zagrożonych						
Odsetek gospodarstw domowych (%)	6,63	5,75	4,54	4,73	5,10	4,76
Pracujące gospodarstwa domowe						
Pracujący na umowę o pracę w działach szczególnie zagrożonych						
Odsetek gospodarstw domowych (%)	17,06	18,74	19,72	19,29	17,94	14,88
Pracujący z inną umową lub samozatrudnieni w działach szczególnie zagrożonych						
Odsetek gospodarstw domowych (%)	9,14	8,45	6,86	7,34	7,82	6,41

Źródło: Myck i in. 2020a.

Tabela 4. Ryzyko finansowe w gospodarstwach domowych w wyniku pierwszej fali konsekwencji gospodarczych pandemii COVID-19 według decylowych grup dochodowych

Grupa ryzyka	Grupy decylowe					
	1	2	3	4	5	6
Wszystkie gospodarstwa domowe						
Pracujący na umowę o pracę w działach szczególnie zagrożonych						
Odsetek gospodarstw domowych (%)	4,30	5,80	10,15	12,18	15,45	15,93
Pracujący z inną umową lub samozatrudnieni w działach szczególnie zagrożonych						
Odsetek gospodarstw domowych (%)	2,85	2,67	4,82	4,61	4,54	6,10
Pracujące gospodarstwa domowe						
Pracujący na umowę o pracę w działach szczególnie zagrożonych						
Odsetek gospodarstw domowych (%)	8,16	12,88	18,12	19,57	22,67	22,01
Pracujący z inną umową lub samozatrudnieni w działach szczególnie zagrożonych						
Odsetek gospodarstw domowych (%)	5,42	5,94	8,59	7,40	6,66	8,43

Źródło: Myck i in. 2020a.

Tabela 5. Ryzyko finansowe w gospodarstwach domowych w wyniku pierwszej fali konsekwencji gospodarczych pandemii COVID-19 według typów rodzin

Grupa ryzyka	Kategorie rodzin					
	Osoby samotne	Samotni rodzice	Małżeństwa bez dzieci	Małżeństwa z dziećmi	Osoby samotne 60/65+	Małżeństwa 60/65+
Wszystkie rodziny						
Pracujący na umowę o pracę w działach szczególnie zagrożonych						
Odsetek gospodarstw domowych (%)	9,69	18,32	11,68	16,06	0,26	0,35
Pracujący z inną umową lub samozatrudnieni w działach szczególnie zagrożonych						
Odsetek gospodarstw domowych (%)	3,33	4,88	4,67	7,61	0,32	0,58
Rodziny pracujące						
Pracujący na umowę o pracę w działach szczególnie zagrożonych						
Odsetek gospodarstw domowych (%)	13,19	24,87	13,91	16,43	4,77	3,69
Pracujący z inną umową lub samozatrudnieni w działach szczególnie zagrożonych						
Odsetek gospodarstw domowych (%)	4,54	6,62	5,56	7,78	5,92	6,16

Źródło: Myck i in. 2020a.

Z pierwszych badań wynika, że w czasie pandemii znacząco wzrosła liczba pracowników realizujących swoje obowiązki zawodowe w 100% zdalnie, a najistotniejszą trudnością był brak kontaktów społecznych oraz odizolowanie. Jednocześnie, choć praca zdalna w czasie pandemii w większym stopniu umożliwiła godzenie obowiązków zawodowych i osobistych, to także w większym stopniu skutkowała zacieraniem się granicy między pracą a życiem prywatnym [Dolot 2020].

Według danych z Badania Budżetów Gospodarstw Domowych z 2018 r., gospodarstwa prawie 330 tys. uczniów nie są wyposażone w komputer z dostępem do Internetu, a w przypadku kolejnych 1 320 tys. uczniów liczba komputerów w ich gospodarstwach jest mniejsza niż liczba uczniów. Ponadto 7,1% gospodarstw domowych zamieszkanych przez uczniów nie posiada komputera lub pokrewnego urządzenia z dostępem do Internetu, w tym 30% na wsi, a w przypadku 17,3% gospodarstw łączna liczba tych urządzeń w gospodarstwie domowym jest mniejsza niż liczba mieszkających w nich uczniów. Oznacza to skalę wykluczenia edukacyjnego na poziomie ponad 1,65 mln, co stanowi ponad 35% wszystkich uczniów w Polsce [Myck i in. 2020b].

Jak wskazują badania potencjalnych skutków pierwszego etapu pandemii na finanse gospodarstw domowych, opracowane w oparciu o dane z Badania Budżetów Gospodarstw Domowych GUS:

– największy odsetek gospodarstw domowych z osobami szczególnie narażonymi na negatywne konsekwencje pandemii jest w miastach powyżej 500 tys. mieszkańców i wynosi on 6,6%, biorąc pod uwagę wszystkie gospodarstwa, a biorąc pod uwagę tylko gospodarstwa, w skład których wchodzą osoby pracujące, sięga 9,1%, odpowiednio 12,4% i 17,1% osób zatrudnionych jest w zagrożonych sektorach na podstawie umowy o pracę (tabela 3);

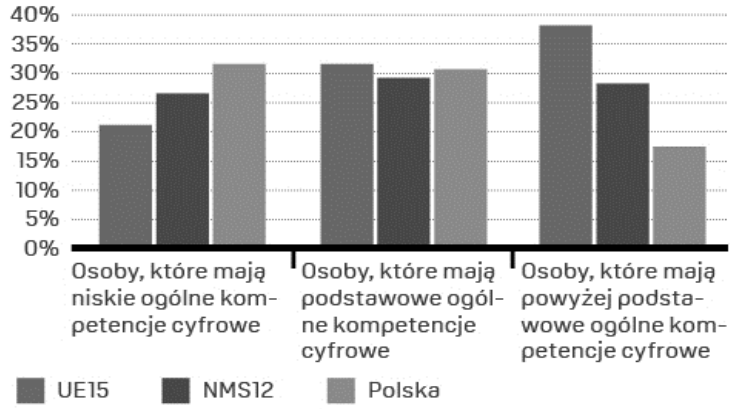
– najwięcej narażonych na negatywne konsekwencje pierwszej fali gospodarczych skutków pandemii jest wśród gospodarstw średniozamożnych. W 6. grupie decylowej wśród gospodarstw z przynajmniej jedną osobą pracującą 8,5% stanowią gospodarstwa, których członek pracuje w zagrożonych działach na umowę inną niż umowa o pracę lub jako osoba samozatrudniona. Łącznie z członkami gospodarstw zatrudnionymi w tych działach gospodarki na umowę o pracę ten odsetek przekracza 30% (tabela 4);

– wśród rodzin, w których przynajmniej jedna osoba jest aktywna zawodowo, najwięcej takich gospodarstw jest w grupie rodziców samodzielnie wychowujących dzieci, wśród których aż 31,5% pracuje w działach szczególnie zagrożonych, a 6,6% pracuje na podstawie innych umów niż umowa o pracę lub prowadzi działalność gospodarczą (tabela 5).

Podjęcie przez banki centralne i banki komercyjne prac nad zmniejszeniem skutków pandemii koronawirusa dla gospodarstw domowych posiadających kredyty konsumpcyjne i hipoteczne doprowadziło do wypracowania stanowiska, polegającego na propozycji wakacji kredytowych w zakresie rat kapitałowych/kapitałowo-odsetkowych przez 3 miesiące, a w niektórych przypadkach 6 miesięcy. Może to rodzić dla gospodarstwa domowego dodatkowe koszty odsetkowe oraz koszty związane z wydłużeniem okresu ważności zabezpieczeń o czas wakacji kredytowych i odraczać faktyczne problemy z obsługą zadłużenia w czasie. Obniżenie przez NBP dwukrotnie stóp procentowych, w tym stopy lombardowej i stopy depozytowej oznacza zmniejszenie części odsetkowych rat kredytowych, ale jednocześnie przy rosnącej inflacji powoduje drastyczny spadek oprocentowania lokat bankowych oraz ich ujemną realną rentowność. Z drugiej strony, gwałtowne umocnienie się franka szwajcarskiego względem złotówki drastycznie pogarsza sytuację klientów posiadających kredyty denominowane w tej walucie nie tylko poprzez wzrost wysokości raty miesięcznej, ale całkowitego zadłużenia do spłaty. Również środowisko instytucji pożyczkowych zaproponowało odroczenie spłaty całości lub części raty o stosowny okres na dostatecznie udokumentowany wniosek klienta. Faktyczny poziom osób tracących pracę będzie uzależniony od dostępności narzędzi tzw. tarczy antykryzysowej o wartości 220 mld zł dla mikroprzedsiębiorstw oraz tarczy antykryzysowej 2.0 dla średnich przedsiębiorstw

o wartości 100 mld zł, a także chęci korzystania z nich przez beneficjentów. NBP wdraża również niestandarodwe instrumenty polityki pieniężnej. Szeroki zakres wykluczenia cyfrowego, rozumianego nie jako dostęp do sieci internetowej, ale posiadanie kompetencji cyfrowych, czyli umiejętności posługiwania się nowoczesnymi technologiami aktywnie w codziennym życiu dla korzystania z usług prywatnych i administracji publicznej wśród polskich gospodarstw domowych nie pozwala na efektywną pracę zdalną[1]. Jak wskazano na wykresie 1, co trzeci polski zatrudniony ma niskie ogólne kompetencje cyfrowe, w UE jest to co piąta osoba. Jak wskazuje wykres 2, polscy pracownicy znacznie rzadziej niż pracownicy UE15 mogą wykazać się ponadpodstawowymi kompetencjami cyfrowymi (18–38%).

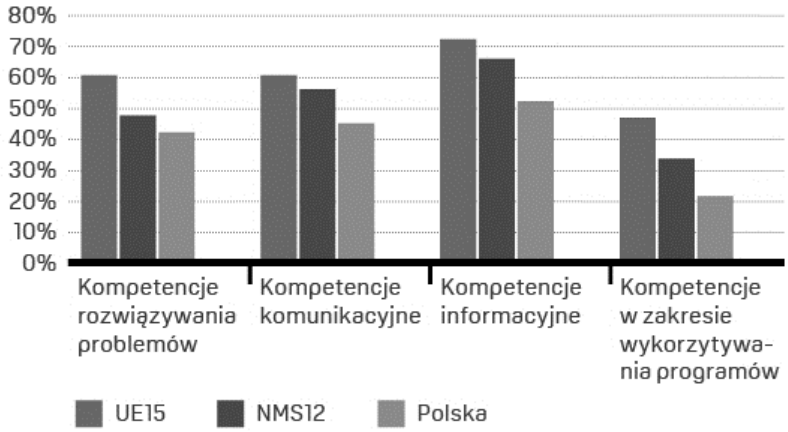
Gospodarstwa domowe, nieposiadające żadnych oszczędności, będą miały problemy z utrzymaniem płynności finansowej, a np.: poprzez utratę pracy lub zawieszenie działalności gospodarczej pojawią się u nich problemy związane z pokrywaniem bieżących zobowiązań, w tym pożyczkowo-kredytowych, wykluczonych z sektora bankowego ze względu na utratę głównego źródła dochodu.



Wykres 1. Poziom ogólnych kompetencji cyfrowych w krajach UE

Źródło: Blim 2018.

[1] Kompetencje cyfrowe to podstawowe umiejętności pozwalające na komunikowanie, pozyskiwanie informacji oraz tworzenie treści w środowisku cyfrowym. Do bardziej zaawansowanych kompetencji cyfrowych, cenionych wśród pracodawców, należą kompetencje odnoszące się m.in. do specyficznych zastosowań ICT (Information and Communication Technologies – technologie informacyjno-komunikacyjne) w różnych obszarach działalności pracowniczej i biznesowej, np. zarządzanie finansami, kontaktami z klientem i procesami logistycznymi [Majos 2017].



Oznaczenia dla wykresu 1 i 2:
UE15 (tzw. stara Unia, czyli kraje, które przystąpiły do Unii Europejskiej przed 2004 r.),
NMS12 (New Member States – kraje, które przystępowały do Unii od 2004 r. – bez Polski),
Polska, jako wyodrębniona kategoria informacyjna.

Wykres 2. Poziom ponadpodstawowych kompetencji cyfrowych[2] w krajach UE

Źródło: Blim 2018.

W ramach ustaw związanych z tzw. tarczą antykryzysową obowiązujących od kwietnia 2020 r. nastąpiła zmiana limitu maksymalnych kosztów pozaodsetkowych kredytu konsumenckiego. Motywacją dla zmiany obecnie obowiązujących przepisów było przeciwdziałanie pobierania nadmiernych kosztów od osób, które mają problemy finansowe będące konsekwencją koronawirusa. Pomimo sprzeciwu branży pożyczkowej i trzech działających na nich związków pracodawców – Polskiego Związku Instytucji Pożyczkowych, Związku Przedsiębiorstw Finansowych i Fundacji Rozwoju Rynku Finansowego przepisy antylichwiarskie weszły w życie w następującym kształcie:

– dla kredytów o okresie spłaty nie krótszym niż 30 dni oblicza się według wzoru:

$$\mathrm{MPKK} \leq (\mathrm{K} \times 15\%) + (\mathrm{K} \times \mathrm{n}/\mathrm{R} \times 6\%) \leq 45\% \ \mathrm{K} \text{ w całym okresie kredytowania,}$$

[2] Obejmują one tworzenie prezentacji lub dokumentów tekstowych, zdjęć, tabel i wykresów, używanie zaawansowanych funkcji arkusza kalkulacyjnego do porządkowania i analizowania danych, napisanie kodu w języku programowania.

– dla kredytów o okresie spłaty krótszym niż 30 dni oblicza się według wzoru:

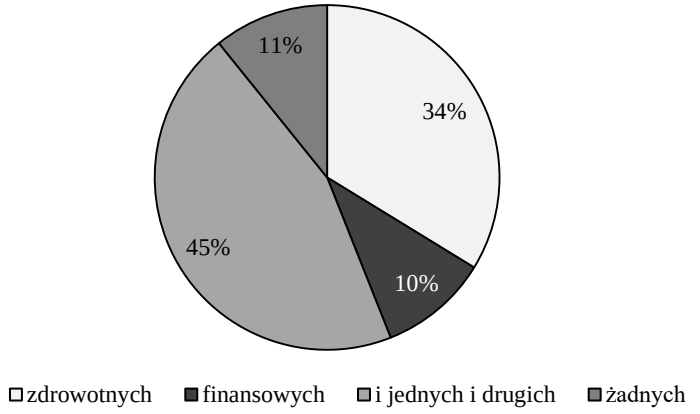
$$MPKK \leq K \times 5\%$$

gdzie:
MPKK – maksymalna wysokość pozaodsetkowych kosztów kredytu,
K – całkowita kwota kredytu,
n – okres spłaty wyrażony w dniach,
R – liczba dni w roku.

Takie ograniczenie kosztów pozaodsetkowych może ograniczyć dostęp do pożyczek pozabankowych wielu osobom, które zmuszone sytuacją będą zasilały podziemie kredytowe i lombardy. Jak wskazują statystyki BIK za 2020 r., pogłębia się zaobserwowana już na przełonie 2019 i 2020 r. recesja na rynku pożyczek pozabankowych w Polsce [Waliszewski 2020], szczególnie po wprowadzeniu zmian związanych z ograniczeniem kosztów pozaodsetkowych.

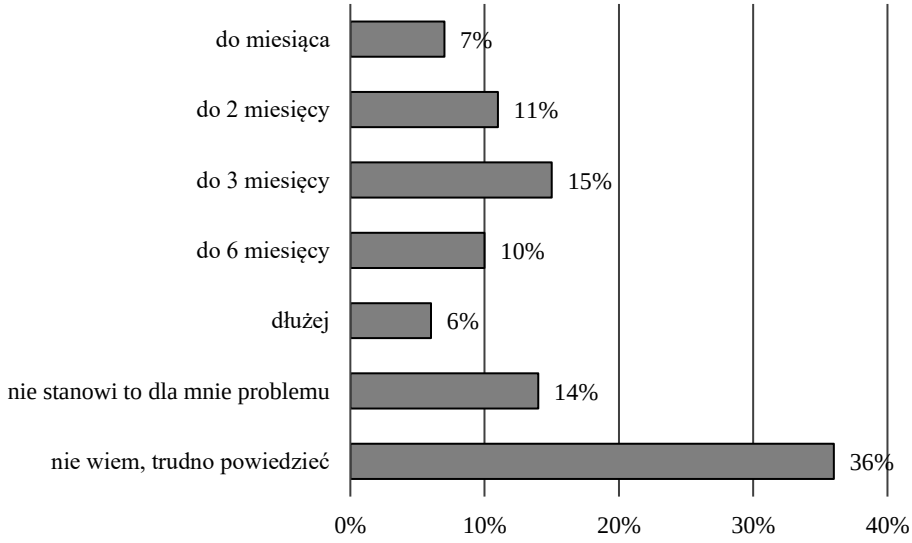
Zmniejszenie mobilności osób w każdym wieku w okresie pandemii może w przyszłości przekładać się na większe ryzyko zachorowań na dolegliwości krążenia i układu ruchu, a zamknięcie osób starszych w ich mieszkaniach przyczynia się do ich alienacji i zwiększa poczucie osamotnienia. Zamknięcie przychodni i oddziałów szpitali powoduje przesunięcie planowanych zabiegów i badań, a to oznacza kryzys służby zdrowia po okresie epidemii, która już przed nią nie była w najlepszej kondycji organizacyjnej i finansowej. Zaostrzenie przez banki w Polsce polityki w zakresie udzielania kredytów hipotecznych m.in. poprzez zwiększenie poziomu wymaganego wkładu własnego przy ogólnej niepewności co do przyszłości wieszczy poważne spadki cen nieruchomości na rynku mieszkaniowym, które przed wybuchem pandemii notowały historyczne maksima. Dane z marca 2020 r. odnośnie liczby wniosków kredytowych na kredyty hipoteczne w porównaniu z rokiem poprzednim wskazują na spadek o 7,6% r/r [BIK, 2020a]. W przypadku kredytów ratalnych udzielanych za pośrednictwem dużych sieci handlowych oraz e-commerce, finansujących zakup takich dóbr jak elektronika, sprzęt AGD, meble, samochody, zmniejszenie liczby zapytań jest jeszcze większe i wynosiło odpowiednio 33,4% r/r w ostatnim tygodniu marca 2020 r. oraz 38,5% r/r w pierwszym tygodniu kwietnia 2020 r. [BIK, 2020b].

Badanie przeprowadzone przez 4P, omnibus CAWI, na reprezentatywnej próbie 1 010 Polaków w wieku 18–75 lat, w dniach 25–27 marca 2020 r. dla BIG InfoMonitor wskazuje, że Polacy obawiają się zarówno problemów zdrowotnych, jak i finansowych w związku z pandemią koronawirusa (wykres 3).



Wykres 3. Jakich problemów obawiasz się w związku z epidemią koronawirusa?

Źródło: *Koronawirus odbiera pracę…*, 2020.



Wykres 4. Jaki okres pandemii wytrzyma Twój budżet zanim pojawią się problemy finansowe?

Źródło: *Koronawirus odbiera pracę…*, 2020.

Niemal co piąty badany informuje bowiem, że ma pieniądze najwyżej na jeden lub dwa miesiące, zbliżony jest też udział przewidujących, którzy deklarują, że oszczędności wystarczą im na trzy miesiące. Najsilniejszy lęk o finanse przeżywają obecnie osoby, które nie mają do dyspozycji żadnych odłożonych pieniędzy, ewentualnie najwyżej jednomiesięczne dochody – to w tej grupie aż 36% odpowiada, że w bezruchu wywołanym koronawirusem wystarczy im pieniędzy maksymalnie na dwa miesiące (wykres 4).

4. SCENARIUSZE ROZWOJU PANDEMII KORONAWIRUSA

Wirtualne spotkanie przywódców państw G-20 pozwoliło na ustalenia listy priorytetów w walce z pandemią:

- Ochrona życia,
- Zapewnienie pracy i dochodów,
- Odbudowa zaufania, utrzymanie stabilności finansowej, powrót na ścieżkę wzrostu i mocne ożywienie,
- Minimalizacja zaburzeń w handlu oraz globalnych łańcuchach dostaw,
- Zagwarantowanie pomocy krajom potrzebującym,
- Skoordynowanie działań w zakresie zdrowia publicznego i finansów [G-20 2020].

Analitycznie te cele można podzielić na dwie grupy. Pierwsza związana z przezwyciężeniem rozprzestrzeniania się paniki, druga z scenariuszami odbudowy aktywności gospodarczej.

Tabela 6 dostarcza ram poznawczych dla uporządkowania praktyki zarządzania ryzykiem systemowym pandemii.

Tabela 6. Praktyka zarządzania ryzykiem systemowym

Istota ryzyka systemowego	System I	System II
Panika	Polaryzacja	Nacjonalizm gospodarczy
Szok asymetryczny	Scenariusze: V,VV, L	Wojna pokoleń

Źródła: opracowanie własne.

Lęk przed śmiercią wśród seniorów i inwalidztwem wśród młodzieży prowadzi do wypłukania warstwy średniej z życia gospodarczego i społecznego. Silna polaryzacja wprost prowadzi do zaniku poczucia solidarności opartej o wspólnotę losu. Rodzi się pokusa odgrodzenia się od innych granicami.

Część decydentów wierzy, że gwałtowne wysłanie popytu i podaży na kwarantannę szybko się zakończy i równie szybko gospodarka wróci do poprzedniego poziomu aktywności. Część uważa, że obecnie dokonują się głębokie zmiany

strukturalne, przechodzimy od realnej do wirtualnej rzeczywistości. Oznacza to, że zniknie popyt na pracę ze względów technologicznych, a nie braku efektywnego popytu na dany typ usług. Pesymiści uważają, że kapitalizm platform będzie funkcjonował w warunkach strukturalnej stagnacji wywołanej przez starzenie się społeczeństw.

Perspektywa nonofinansów uznaje, że to co obserwujemy jest pierwszą odsłoną wojny pokoleń, którą definiujemy jako brak możliwości osiągnięcia jakości życia pokolenia odchodzącego z życia przez pokolenie cyfrowo wykształcone, ale pozbawione widoków na dobrą pracę i życie [Bangham 2020]. Kryzys gospodarczy wywołany pandemią całkowicie odmieni sytuację związaną z długiem publicznym. W ciągu ostatniego stulecia poważne kryzysy światowe często prowadziły zarówno do zaciągania przez rządy pożyczek na dużą skalę, jak i do zmian – często radykalnych – w ich sposobie postępowania z wierzycielami. Walka z COVID-19 prawdopodobnie nie będzie stanowić wyjątku. Opracowywane obecnie plany ratowania gospodarki prawdopodobnie przyćmią plany zastosowane w czasie kryzysu finansowego; wartość programu amerykańskiego może sięgnąć ok. 10% PKB. Załamanie produkcji i wpływów podatkowych również może być większe, zaś zadłużenie przynajmniej kilku gospodarek zapewne znacznie przekroczy 150% PKB [The Economist 2020].

PODSUMOWANIE

Wiedza i umiejętności zarządzania ryzykiem systemowym doprowadziły do stwierdzenia, że o stabilności globalnego systemu finansowego decydują nawyki finansowe miliardów ludzi. Obecnie sukces w walce z pandemią koronawirusa zależy od zmiany nawyków zdrowotnych ludzkości. Warto zatem wykorzystać doświadczenia zarządzania ryzykiem systemowym do analizy COVID-19. Pandemia koronawirusa oznacza szok podażowy i popytowy dla gospodarek, okres zastoju ma wpływ na sytuację finansową gospodarstw domowych i ich aktywność na rynku pracy. Wychodzenie z obecnego kryzysu będzie zapewne trwało wiele miesięcy, a ostateczne koszty pandemii zostaną podzielone pomiędzy sektor prywatny i publiczny. Presja na zmianę nawyków otwiera pole dla systemowego budowania zaufania poprzez wykorzystanie technologii blockchain do inicjowania kontaktów i płatności typu P2P, B2B oraz C2C. Tektoniczne przesuniecie ze świata rzeczywistości realnej do wirtualnej tworzy warunki do emisji przez NBP pieniądza elektronicznego kreowanego przy wykorzystaniu powszechnego rachunku osobistego w NBP.

BIBLIOGRAFIA

Anderson R.M., Heersterbeek H., Klinkenber D., Hollingsworth D.T., 2020, *How will country-based mitigation measures influence the course of the covid-19 epidemic?* „The Lancet", March.

Atkeson A., 2020, *What will be ten economic impact of COVID-19 in the US? Rough estimates of disease scenarios*, „NBER Working Paper", no. 26867.

Auer R., Cornelli G., Frost J., 2020, *Covid-19, cash, and the future of payments*, „BIS Bulletin", no. 3.

Banham G., 2020, *In this coronavirus crisis, do families have enough savings to make ends meets?*, Resolution Foundation.

BIK, 2020a, *BIK Indeks – Popyt na Kredyty Mieszkaniowe wyniósł w marcu 2020 r. (–3,1%)*, 6.04.2020.

BIK, 2020b, *Koronawirus a popyt na kredyty ratalne*, 8.04.2020.

Blim M., 2018, *Pracownik i jego kompetencje cyfrowe*, 1.03.2018, https://aspolska.pl/pracownik-i-jego-kompetencje-cyfrowe/ [dostęp 4.04.2020].

Dolot A., 2020, *Wpływ pandemii COVID-19 na pracę zdalną – perspektywa pracownika*, „E-mentor", nr 1.

Fan V.Y., Jamison D.T., Summers L.H., 2016, *The inclusive cost of pandemic influenza risk*, „NBER Working Paper", no. 22137.

G-20, 2020, *Statement on COVID-19*, BIS.

How to pay for the pandemic, 2020, „The Economist", 25.03.2020.

Huynh K.P., Molnar J., Shcherbakov O., Yu Q., 2020, *Demand for Payment Services and Consumer Welfare: The Introduction of a Central Bank Digital Currency*, „Bank of Canada Staff Working Paper", no. 7.

Koronawirus odbiera pracę i pustoszy portfele Polaków, 2020, https://media.bik.pl/informacje-prasowe/498172/koronawirus-odbiera-prace-i-pustoszy-portfele-polakow [dostęp 14.04.2020].

Majos A., 2017, *Kompetencje cyfrowe pracowników MŚP. Polska na tle UE*, „Biuletyn Euro-Info", nr 1.

Myck M., Oczkowska M., Trzciński K., 2020a, *Skala ryzyka finansowego dla gospodarstw domowych: pierwsza fala konsekwencji gospodarczych pandemii COVID-19*, Centrum Analiz Ekonomicznych, Komentarze CenEA, 22.03.2020.

Myck M., Oczkowska M., Trzciński K., 2020b, *Zamknięte szkoły: warunki uczniów do nauki zdalnej w okresie pandemii COVID-19*, Centrum Analiz Ekonomicznych, Komentarze CenEA, 28.03.2020.

Waliszewski K., 2020, *Determinanty recesji na rynku pożyczek pozabankowych w Polsce*, „Finanse i Prawo Finansowe", nr 1(25).

PANDEMIC OR GENERATIONAL WAR?

Abstract

The article deals with the COVID-19 coronavirus pandemic and its potential impact on the economy, public finance system and personal finances. The shock of the virus outbreak and expansion on a global scale poses enormous challenges to economies, public finances and health systems related to the threat of recession, drastic reduction in personal income in households, the need to develop government programs mitigating the effects of a pandemic, and the central

bank joining in the form of rate cuts interest and reserve requirements, as well as the launch of non-standard monetary policy instruments quantitative easing (QE). The aim of the study is to propose a language of nanofinance to describe a pandemic as a destruction of the mechanism of intergenerational and intra-generational solidarity. The main hypothesis of the study is that the quality of financial risk management of everyday life will determine the scale of financial losses and the time necessary to overcome the socio-economic collapse caused by a pandemic.

Keywords: COVID-19 pandemic, personal finances, crisis management, nanofinance.

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DOES BANK RESOLUTION RULE OUT THE USE OF PUBLIC FUNDS? THE CASE OF THE PODKARPACKI BANK SPÓŁDZIELCZY

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Abstract

On 15 January 2020 Polish resolution authority made a decision to launch the resolution of a regional cooperative bank. The aim of the resolution was to maintain the service of local government units, considered as the critical function of the bank. The tool used was a bridge bank combined with bail-in to subordinated bonds and unguaranteed deposits, including deposits from local government units. The author is of the opinion that the write-off deposits from public entities was a substitute of the insufficient amount of liabilities contractually eligible for bail-in, served as the instrument enhancing credibility of resolution as well as protecting other creditors from excessive losses (i.e. mitigating contagion risk). The presented case of bank resolution, has been assessed as an example of intentionally bending of the stiff BRRD rules to an unusual case to find the practical, socially acceptable solution. By comparing this case with resolution of other small banks in the EU, the author argues that national authorities seek to limit the scope for bail-in and try to use the financial arrangements within the resolution of small local banks as more secure for the banking sector and socially acceptable manner.

Keywords: bail-in, bank insolvency costs, bank resolution, bridge bank, BRRD, cooperative bank.

JEL Class: G21, G28, H12, R11.

INTRODUCTION

On January 15th 2020, the Polish resolution authority Bankowy Fundusz Gwarancyjny (Bank Guarantee Fund – BFG) made a decision to launch resolution of the regional cooperative bank – Podkarpacki Bank Spółdzielczy in Sanok (PBS). The BFG considered service of local government units as a critical function provided by the bank, and thus as a resolution objective. The process began two days later with the use of the bridge bank combined with bail-in, as the resolution tool. Major parts of credits and deposits were moved to the bridge institution Bank Nowy BFG SA. Client services were restored on January 21, after the move had been completed, The BFG stated that due to the huge negative equity (PLN 182 million) was forced to apply the bail-in to both subordinated bonds (100%) and uninsured deposits (43%), to get the bank's net asset value (NAV) equal zero. A significant share of depositors whose funds were written off were local governments and their units (public hospitals and schools), which may be surprising in view of the resolution's objective.

This article is related to a number of previous papers focusing on the bank resolution and the use of bail-in. The resolution of PBS can be compared to similar actions taken with respect to four small banks in Italy, in November 2015, as well as to two savings banks (Andelskassen) in Denmark, in 2016 and 2018, where bridge banks (combined with bail-in) were selected as the appropriate resolution tools [Lintne and Lincoln 2016]. A description of the resolution framework and tools is presented in the „Key Attributes" issued by the Financial Stability Board [FSB, 2014] and in Directive 2014/59/EU of the European Parliament and of the Council of May 15, 2014, establishing a framework for the recovery and resolution of credit institutions and investment firms [BRRD, 2014]. Acharya and Yorulmazer [2007] described the impact of a bank's asset specificity on the resolution costs (misallocation costs) that could occur if a bank is liquidated or its assets are transferred to another entity in the course of resolution. Avgouleas and Goodhart [2015] conducted an extended critical, legal, and economic analysis of the key potential risks connected to a bail in. They pointed out that bail-in incentivizes certain creditors to enhance their responsibility for the bank, thus reinforcing market discipline, but it implies a higher contagion risk, and its use is limited, suggesting a combination of bail in and bailout. Geithner [2014] discussed the bail-in to deposits. He pointed out is that depositors by choosing the bank (which is not done by taxpayers), can theoretically monitor its condition and, when the risk of the bank increases, make a timely decision to withdraw funds, increasing the bank's incentives to reduce risk (market discipline). However, he presented an immediate counter-argument that certain groups of unguaranteed depositors (e.g. the above mentioned schools, libraries and clinics) are not able (due to information asymmetry and insufficient preparation) to monitor effectively the

bank condition. Similarly, Bernard et al. [2017] and Benink [2018] argued that unexpected losses may not be absorbed by unsecured debt holders. Boccuzzi and De Lisa [2017] identified the emergence of uncertainty about the bail-in scale as the main reason for the potential outflow of deposits, (due to fear of a wide range of write-offs involving non-guaranteed deposits and other liabilities). The question of choosing when to launch a resolution, was examined by Dewatripont [2014], who states that too late start of resolution can be more costly for taxpayers than using public funds earlier. Pandolfi [2018] proposed a model that showed that the assumption that all losses will be covered by bail-in leads to the risk of a credit crunch. In order to reduce that risk, the regulator should declare the use of the bail-in together with the bail-out but not replace the bail-out with the bail-in. Miklaszewska [2017] noted that the resolution scheme described in the BRRD had been designed for large systemically important banks. Rigid application of this scheme to small entities, like cooperative banks, may create political and social problems. The goal of this paper is to assess the bail-in to deposits from public entities (and its scale) as the factor enchaining credibility of the resolution. The author argues that the write-off deposits from public entities may in certain situations be necessary to ensure the credibility of the resolution and mitigate the risk of contagion. In the presented case those deposits played the role liabilities contractually eligible for bail-in substituting insufficient amount of MREL[1].

The research methods used in the paper are:

- analysis of the bank's financial data and public estimation of the value by estimating the value of the bank drawn up for the resolution,
- comparative analysis of PBS resolution and similar cases in Europe.

The paper is organized as follows: Section 1 presents the concept of the bank resolution and its possible consequences, especially focused on the small banks, Section 2 presents the cases in EU, similar to the PBS case, Section 3 presents the background and objectives of the PBS resolution as well as controversies and potential consequences, Section 4 concludes and summarizes the main results of this study, showing some important policy implications.

1. THE IDEA OF RESOLUTION

The sources of the resolution concept can be found in the so-called Too Big To Fail (TBTF) doctrine and the resulting need to prevent the collapse of large banks. This doctrine was later modified to some extent, due to the adoption of other

[1] Resolution authorities can impose a minimum requirement for own funds and eligible liabilities (MREL) on European banks. The MREL consists of own funds and part of a bank's liabilities. If a bank fails and goes into resolution, the MREL acts as a buffer to absorb losses and to provide new capital to the bank.

criteria that would qualify a bank as an institution whose failure would pose a threat justifying state intervention (financial support). Such banks were described as „too important", „too unique" or „too complex" and where there are significant links to other financial institutions or to the economy of the country as „too interconnected"[2]. During the recent crisis, the only way to avoid the threats arising from the failure of a large bank was to provide public financial support This situation gave rise to Key Attributes, published in 2011 by the Financial Stability Board [FSB, 2011] and modified in 2014 [FSB, 2014a]. These principles described the treatment of banks whose failure could cause a disturbance in the economy, emphasizing the need to act in a way that does not expose taxpayers to the risk of losses. The costs of winding up (or restructuring) such a bank should be covered first by the bank's shareholders and then by the bank's creditors (more precisely: entities with respect to which the bank has uninsured or unsecured liabilities). Creditors' share of these costs is expected to enhance the bank's internal loss absorbing capacity [FSB, 2014b]. The FSB principles have been introduced in many countries. Besides the European Commission has since 2010 proposed nearly 30 sets of rules to ensure a safer, sounder and more stable EU financial sector[3]. In 2014 the European Parliament adopted the Bank Recovery and Resolution Directive [BRRD, 2014]. According to that regulation, resolution means the use of a so-called resolution tool by a designated state or supranational institution (resolution authority – RA), consisting of sale of the business, establishment of a bridge bank, separation of assets or recapitalization of the bank. The RA also prepares a resolution plan for each bank[4], i.e. a comprehensive document detailing the bank's characteristics and preferred path if the institution is failing, indicating the tools to be used.

[2] Acharya and Yorulmazer [2007] have shown that a similar problem occurs when there is a threat of bankruptcy of many banks, which also creates pressure on state authorities to provide similar support (too many to fail). Such an „implied guarantee" by the State may create an incentive for so-called herd behavior, in the form of banks building portfolios of assets with a similar risk profile, resulting in a lack of risk diversification in the banking sector.

[3] In June 2012, EU Heads of State and Government agreed to create a Banking Union, completing the European Monetary Union by providing for the centralized application of EU-wide rules for banks in the euro area. The Banking Union guarantees the harmonized application of European regulation through the creation of centralized Supervision and Resolution Powers (Single Supervisory Mechanism and Single Resolution Mechanism).

[4] The plan also includes an assessment of the bank's resolution plan usually expressed in two aspects [EBA, 2014; FSB, 2014a] of credibility and feasibility. Feasibility means that the resolution authority has the necessary powers to carry out the planned strategy, and credibility means that there are no unacceptable negative consequences for the financial system and the economy with the chosen course of action.

According to the BRRD Directive, a resolution can be carried out when:

a) the bank is failing or likely to fail;
b) action by supervisory authorities or private parties will not restore the normal functioning of the bank within a short time;
c) the resolution is in the public interest, in order to:
   - ensure the continuation of critical functions,
   - avoid a negative impact of a bank failure on the stability of the financial system (in particular to prevent the effect of contagion),
   - prevent overcompensation of public funds,
   - reduce losses for depositors and investors,
   - protect (sufficiently) client funds and assets.

The resolution process may result in the closure of the bank, i.e. its disappearance from the market as a separate entity (closed resolution strategy) through liquidation or sale of its assets and liabilities to another institution. In the case of difficulties to find a buyer, it is assumed that the existing bank or part of it will be maintained (open resolution strategy) through recapitalization, transfer to another entity or (ultimately) to a bridge bank. The latter solution (bridge bank) is in fact a postponement of another tool, e.g. until there is a buyer, ready to buy all or part of the failing bank. The goal of bank resolution is to prevent its failure from devolving into a systemic banking crisis and to minimize the cost to taxpayers. The bank creditors (including uninsured depositors) are imposed to participate in covering the excessive losses of a bank. This concept considers measures that make it less likely that banks will fail and that limit losses to taxpayers in the event of a bank failure[5]. The possibility of witting-off the bank's liabilities to its creditors, commonly called as bail-in, made in order to cover losses or restore bank's equity is a precondition for bank resolution in the European Union (EU). The authorities cannot use public funds[6], before the initial losses are covered by bank shareholders and creditors. Adopting the rule that, no creditor should be worse off than in liquidation (NCWOL), the BRRD ensures that no creditor incurs a loss greater than if the institutions had gone into liquidation. Bail-in facilitates both a smooth resolution process and its completion within a short time, which makes this mechanism popular among regulators. Moreover, bail-in incentivizes certain creditors to enhance their responsibility for the bank, thus

[5] However, implementing this resolution framework efficiently requires that financial markets perceive it as credible. This credibility depends on predictability and the public acceptance of bail-in rules for creditors (priority and extent), prevention of contagion, and the feasibility of resolution in accordance with these rules. The feasibility of resolution is strictly connected with ensuring that financial institutions have sufficient loss-absorbing capacity (LAC) built up from equity, contingent convertibles (CoCos), and liabilities available for the bail in. Fear of contagion, a lack of public acceptance, and insufficient capacity by the bank to cover losses (or, alternatively, to restore equity) undermine the credibility of the resolution framework.

[6] BRRD, Arts 44(5)&(7), 37(10)(a), Rec. 73.

reinforcing market discipline [Avgouleas and Goodhart 2015]. However, bail-in is not a tool without weaknesses. Some authors point out that in case of unexpected losses, the coverage of the losses in the bail-in process will encounter significant difficulties [Benink 2018; Bernard et al. 2017], and the only way to increase the bank's ability to absorb losses is to increase its capital buffers. In addition, charging the bank's creditors with insolvency costs increases the risk of contagion to other financial institutions, if the bank (the subject to the resolution) had liabilities to them. Bail-in without action to protect the rest of the financial system, in particular in the absence of public support (fiscal backstop), may cause creditors to run away from other banks. This may extend the disruption to the system as a whole, even if those banks manage to maintain sufficient debt levels to allow for full cancellation or conversion [Avgouleas and Goodhart 2015]. When considering the use of bail-in, it is necessary to pay attention to the structure of liabilities within a bank and in particular to differentiate them according to the creditor-bank relationship. In general, three types of bank creditors can be distinguished:

- depositors and entities using the bank's intermediation in the transfer of payments and custody services,
- counterparties in market operations, exchanges and clearing houses,
- holders of the bank's bonds and other forms of unguaranteed debt (including subordinated debt and contingent capital, i.e. debt instruments subject to conversion at an early stage of the bank's problems.

It may seem that only the bank's liabilities to the last group of creditors should be written off (or converted into capital) within the resolution process, but the scope of bail-in in the BRRD is wider and concerns all the bank liabilities that are not explicitly excluded[7]. In order to make the resolution effective the BRRD provides that banks must comply with a minimum requirement of own funds and liabilities eligible (contractually) to bail-in (MREL)[8]. However the Article 46(3)(c) gives resolution authorities the power to exclude (in exceptional circumstances) the liabilities of individuals (above the guarantee limit) and small and medium-sized enterprises. The main reason for leaving this possibility in the hands of national resolution authorities is the fear of contagion[9]. The optional exclusions leave an important discretionary power in the hand of a local resolution authority. That power may be used when exceptional circumstances occur, in

[7] BRRD, Article 44(1).

[8] The concern about the possibility of extending that scope during the resolution process may result in a withdrawal of funds from the bank and, as a consequence, the need for significant liquidity support for the bank during the resolution [Tröger 2017]. A consequence of the increased liability of creditors could therefore increase the cost of financing for banks and worsen conditions for borrowers.

[9] BRRD, Article 46(3)(c), (d).

particular when the bail-in is not applicable within a reasonable timescale or there is concern that the bail-in may have negative impacts on the continuity of critical functions or may cause destruction in value or, finally, when there is a risk of generating widespread contagion which could cause serious disruption to the economy. The wider application of such an exemption allows for the protection of „vulnerable" segments of depositors with no guarantee. Such protection allows to strengthen the trust of these social groups both in the bank and in state institutions (supervision, resolution authority)[10]. In such a case bank's losses must be transferred to other creditors, before the financial arrangements (the resolution fund) can provide a contribution to the bank in order to cover losses not absorbed through the bail-in. The BRRD allows, in such a case, for the use of financial arrangements only where bail-in has been applied to an amount of not less than 8% of the bank's total liabilities (including own funds). Moreover, a cap on the use of the resolution fund is established, corresponding to 5% of the total liabilities of the bank under resolution. The scale of the bail-in required for a credible resolution is determined on the basis of a bank valuation. To ensure that authorities exercise these powers in ways those: reduce the risk of costs falling on the taxpayer, preserve value (where possible) and respect the property rights of affected shareholders and creditors, the BRRD requires independent valuations (3 types of valuation) carried out by independent experts. Those valuations are critical to resolution execution as far as the purposes of the resolution, selected tool and compliance with NCWOL rule are concerned [EBA 2019].

- Valuation 1 (prior to resolution): valuation required to inform the determination of whether the conditions for resolution or the write-down or conversion of capital instruments are met[11].
- Valuation 2 (prior to resolution): valuation required to inform the choice of resolution action to be adopted, the extent of any eventual write-down or conversion of capital instruments and other decisions on the implementation of resolution tools[12].
- Valuation 3 (after resolution): valuation required to determine whether an entity's shareholders and/or creditors would have received better treatment if the entity had entered into normal insolvency proceedings and could therefore claim under the „no creditor worse off" rule[13].

[10] When announcing a policy of mandatory bail-in in case of bank failure, the authorities cannot ignore the consequences for bank financing and the functioning of the credit market. In other words, bail-in cannot be seen as a panacea for the problem of „banks too big to fail" and „too many to fail" and should be used together with other available tools, including the use of public funds (bail out).

[11] Under Article 36(4) of the BRRD.

[12] Ibid.

[13] Under Article 74 of the BRRD.

In principle, the resolution process can start while the bank is still „technically solvent"[14]. The formal justification for such a decision before the NAV becomes negative (setting up the point of non-viability – PONV) may be the long-term inability of the bank to comply with prudential standards (e.g. capital requirement). An early decision increases the chances of a successful resolution and can therefore reduce uncertainty for the bank's creditors and financial institutions and thus contribute positively to the stability of the financial sector [Dewatripont 2014]. However, such a decision should be the subject to claims by the bank's existing shareholders, who may sue the supervisory authorities for deliberate action to take away the „solvent bank" and transfer it to new owners. For this reason, it is important to develop legal solutions that allow competent authorities to act in economically justified cases without having to wait for the technical insolvency of the bank.

2. THE PREVIOUS EXPERIENCE

According to the Single Resolution Board (SRB), the Directive's regime has involved the resolution of four banks, based in different EU countries: Spain, Italy and Latvia[15]. However, given the size of these banks, their specificities and the resolution tools used, these cases are not a good benchmark. The resolution of PBS seems to be comparable to the cases of two savings banks (Andelskassen) in Denmark[16] as well as to four small banks in Italy (Banca Marche, Banca Popolare dell'Etruria e del Lazio, Cassa di Risparmio di Ferrara and Cassa di Risparmio di Chieti)[17]. In all those cases bridge banks (combined with bail-in) were selected as the appropriate resolution tools [Lintner and Lincoln 2016].

On 22 November 2015, Banca d'Italia as the Italian resolution authority and the Government of the Italian Republic decided to launch the resolution process in four banks: Banca Marche, Banca Popolare dell'Etruria e del Lazio, Cassa di Risparmio di Ferrara and Cassa di Risparmio di Chieti. The market share of these four banks did not exceed 1% in loans and 2% in guaranteed deposits. Any of the four banks were split into a „good" bridge bank each and into one single „bad" bank. That „bad" bank was the vehicle set up for the transfer of all of the problem assets (especially NPLs) and liabilities. Please note that the application of the bail-in was not yet in force, since Italian government has tried to postpone the full entry into force of the bail-in provision in order to avoid mandatory write-off

[14] NAV is still positive.

[15] Banco Popular (Spain), Banca Popolare di Vicenza and Veneto Banca (Italy), ABLV (Latvia).

[16] Resolution of Andelskassen took place in 2016 and 2018.

[17] Resolution of four small Italian banks has been launched in November 2015.

subordinated bonds held by individuals[18]. In order to ensure that public funds are not (at least formally) used to cover losses incurred by these banks, the three largest Italian banks (Unicredit, Intesa and UBI), put in advance the money to the resolution fund[19]. The operation to resolve the four banks without a haircut to senior bondholders required the three biggest Italian banks to advance money to the resolution fund and was only possible because the small market share of the failing banks. The total contribution of the resolution fund [Banca d'Italia 2017] amounted to about 3.6 billion: (1.7 billion to absorb losses in the original banks, 1.8 billion to recapitalize the bridge banks and 140 million to inject the minimum capital in the bad bank).Those measures were designed to protect retail bond holders. For this purpose, the resolution fund supported by the money borrowed from the three biggest Italian banks was used in the manner that did not meet the target required under the BRRD. Although the protection of retail debt holders is not a resolution objective, unless regarded as a critical function, an exposure of such bank creditors to losses may have contagion effects (for example, resulting in a bank run) or be politically sensitive. In that case the Italian Government intentionally postponed the full implementation of the BRRD Directive and set upset up resolution fund to absorb losses (at that time without the prior 8% bail-in requirement) by collecting ad hoc ex post bank contributions.

By October 5, 2015, the Danish Financial Supervisory Authority[20], acting also as the resolution authority concluded that attempts to meet the solvency requirement set out in the recovery plan had failed. The savings bank Andelskassen J.A.K Slagelse was likely to fail, and no alternative measures were available within a reasonable time to prevent the failure. The authority considered that the conditions for resolution were fulfilled, including that resolution was in the public interest, however resolution objectives were not clearly presented. The Danish resolution authority, determined that the resolution of then was in the public interest to allow its critical functions to continue, and protect depositors and client funds. A bridge bank[21] has been established to take over ownership of the failing bank. The bridge bank was wholly owned and capitalized by the Danish financing arrangements (resolution fund). The authority decided to cancel all the contributed capital, write down relevant capital instruments and bail-in for loss absorption all the subordinated and certain senior bank liabilities. The same form of decision and the same measures were taken on September 13, 2018 with respect to Københavns Andelskasse. Both resolved entities were small local savings

[18] The resolution process was carried out under intense scrutiny by the media, which placed negative emphasis on the banks and highlighted the issues affecting subordinated retail bondholders.

[19] The resolution of the four banks was launched before full implementation of BRRD in Italy. That procedure could not be applied in case of PBS.

[20] Finansiel Stabilitet.

[21] Broinstitut I A/S.

banks with the amount of total assets on the level of EUR 50 million (Andelskassen J.A.K Slagelse – DKK 306,41 million, and Københavns Andelskasse – DKK 411 million) with market share about 0.01% in the Danish banking sector. In contrast to the Italian case, the resolution of both banks in Denmark were arranged under the fully implemented BRRD but also conducted through the application of the bail-in tool in conjunction with the bridge bank tool. As a consequence, some of the unguaranteed deposits (senior debt) were written off.

Table 1. Comparison of the small, local banks resolved in the EU

Category	Banca delle Marche	Banca Popolare dell'Etruria e del Lazio	Cassa di Risparmio di Ferrara	Cassa di Risparmio della Provincia di Chieti	Andelskas-sen J.A.K. Slagelse	Køben-havns Andel-skasse	Podkar-packi Bank Spółdziel-czy w Sa-noku
1	2	3	4	5	6	7	8
The date of launching resolution	November 22, 2015	November 22, 2015	November 22, 2015	November 22, 2015	October 5, 2015	September 13, 2018	January 15, 2020
Total assets (EUR bn)	22.7	12.3	6.9	4.7	0.04	0.05	0.68
Loans (EUR bn)	17.3	6.1	4.6	2.1	0.02	0.02	0.32
Deposits (EUR bn)	7.2	6.4	3.4	2.5	0.03	0.04	0.62
Number of branches (EUR bn)	308	175	106		0	0	78
Market share (within the banking sector)	0.37%	0.33%	0.17%	0.13%	0.01%	0.01%	0.18%
Market share (among cooperative banks)	n/a	n/a	n/a	n/a	1.93%	2.42%	2.2%
The resolu-tion regime	pre-BRRD	pre-BRRD	pre-BRRD	pre-BRRD	full-BRRD	full-BRRD	full-BRRD

1	2	3	4	5	6	7	8
The objection	Protection of all senior creditors and individuals holding subordinated debt	Protection of all senior creditors and individuals holding subordinated debt	Protection of all senior creditors and individuals holding subordinated debt	Protection of all senior creditors and individuals holding subordinated debt	Not clearly stated*.	Not clearly stated.	Continuation of the critical function – servicing local government units
The tool	a bridge bank combined with bail-in and a bad bank	a bridge bank combined with bail-in and a bad bank	a bridge bank combined with bail-in and a bad bank	a bridge bank combined with bail-in and a bad bank	a bridge bank combined with bail-in	a bridge bank combined with bail-in	a bridge bank combined with bail-in and a bad bank
The scale of bail-in	Write-off capital owners and subordinated creditors (individuals, who held subordinated bonds were fully compensated)	Write-off capital owners and subordinated creditors (individuals, who held subordinated bonds were fully compensated)	Write-off capital owners and subordinated creditors (individuals, who held subordinated bonds were fully compensated)	Write-off capital owners and subordinated creditors (individuals, who held subordinated bonds were fully compensated)	Write-off capital owners and full bail-in to subordinated and senior creditors (including not-covered deposits and DGS)	Write off capital owners, and full bail-in of subordinated and senior creditors (including not-covered deposits and DGS)	Write-off capital owners, and full bail-in to subordinated and partial (43%) of senior creditors
The use of financial arrangements	Capitalization of the bridge and the bad bank as well as partial covering loses	Capitalization of the bridge and the bad bank as well as partial covering loses	Capitalization of the bridge and the bad bank as well as partial covering loses	Capitalization of the bridge and the bad bank as well as partial covering loses	Capitalization of the bridge bank	Capitalization of the bridge bank	Capitalization of the bridge and the bad bank
Remarks					Some creditors received compensation under the NCWOL principle		

* Notwithstanding the bank's small relative size, the Finansiel Stabilitet, as the Danish resolution authority, determined that the resolution of the bank was in the public interest to allow its critical functions to continue, which will not be met if the Institution is subject to bankruptcy proceedings.

Source: Author's elaboration based on Banca d'Italia, 2017; BFG, 2020; Finansiel Stabilitet, 2015; 2018.

3. THE RESOLUTION OF THE PBS

3.1. The background

In recent years, Podkarpacki Bank Spółdzielczy w Sanoku (PBS) was the second largest cooperative bank in Poland. At end-June, 2019, its total assets were equal PLN 2.8 billion. The Bank operated in the Podkarpackie Province through a network of 78 bank outlets. The Bank did not belong to any association of cooperative banks and was not a member of the institutional protection system (IPS). The roots of the bank date back to 1871. On 9 April 1871, the District Advance Society in Sanok was established under the Act on Cooperatives. The bank was established in its current form in 1997 through the merger of local smaller cooperative banks. In 2000, the Cooperative Bank in Sanok changed its name to – Podkarpacki Bank Spółdzielczy in Sanok. The Bank's offer included a full range of services: accounts, card loans payment insurance and capital funds. The Bank's clients were farmers individual small and medium-sized enterprises as well as large enterprises and local governments. The Bank built the image of an institution very positively assessed by customers, which was to be proved by numerous awards and distinctions it won. Moreover, the bank was very innovative by introducing modern technologies to the cooperative sector, including: biometric ATMs, mobile applications and coin-operated cash machines. In the annual report for 2015, the bank reported a net profit of PLN 30 million (despite the worsening financial condition), thanks to an unusual operation. It consisted in transferring the trademark to a subsidiary and granted it the right to use it, and then started using the trademark on the basis of an operating lease agreement. This allowed, as noted by the auditor examining the bank's report, to show a profit of PLN 47.4 million on this operation but at the beginning of July 2016, the bank published an adjustment to the annual report (carried out at the request of the Polish Financial Supervision Authority), which changed the manner of recognising the impact of the mark's valuation on the results and created additional provisions for credit exposures and write-downs on the value of financial fixed assets, which had a negative impact on the balance of provisions. As a result, the bank reported a loss of PLN 48.3 million for 2015 and was obliged by the Polish Financial Supervision Authority (Komisja Nadzoru Finansowego – KNF) to work out and implement the recovery plan[22].

[22] On 7 October, 2016, the KNF approved the recovery plan of Podkarpacki Bank Spółdzielczy for the years 2016 to 2020, submitted by the bank on 19 September 2016.

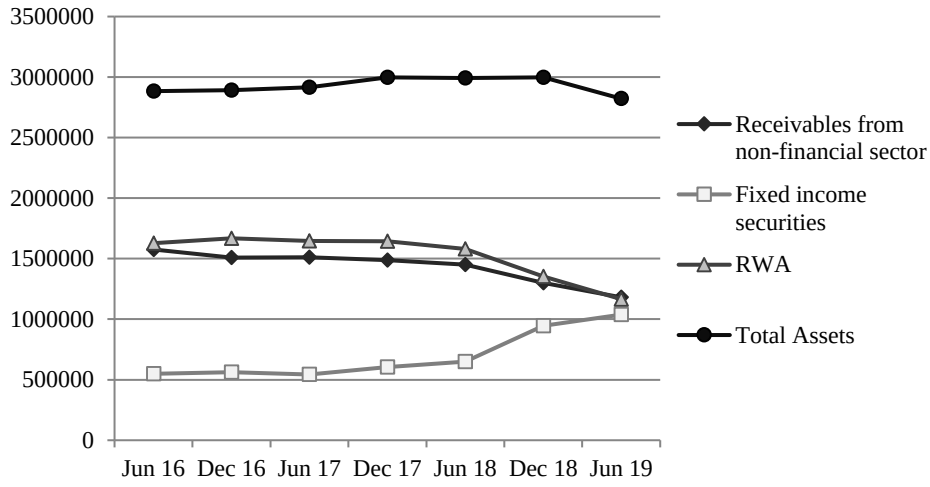

Figure 1. Selected asset categories (PLN thousand)

Source: Author's calculations based on PBS, 2016a; 2016b; 2017a; 2017b; 2017c; 2018a; 2018b; 2019a.

On 10 March 2017 the bank submitted a membership declaration to the Institutional Protection System (IPS), established by the Bank Polskiej Spółdzielczosci Group (BPS), on joining this Cooperative, and also a declaration with attachments, on expressing willingness to join the IPS. By the letter dated 4 September 2017, but the Management Board of the Cooperative refused to give the consent to the accession. Since mid-2017, bank's capital adequacy ratios have been systematically decreasing and according to the data at the end of 2018, the bank no longer met the supervisory standards. In the first half of 2019, its financial condition deteriorated dramatically. The main reason for the rapid decrease in capitals was the loss from previous years. In the amendment to the financial report [PBS 2019b] the bank stated that as a consequence of the current capital situation of the bank, the KNF may apply measurers implying the possibility for the Bank Guarantee Fund to launch resolution[23].

[23] Explanation of why market discipline proved to be ineffective in this case and unguaranteed deposits remaining in the bank will be the subject of a separate article.

Fig. 2A

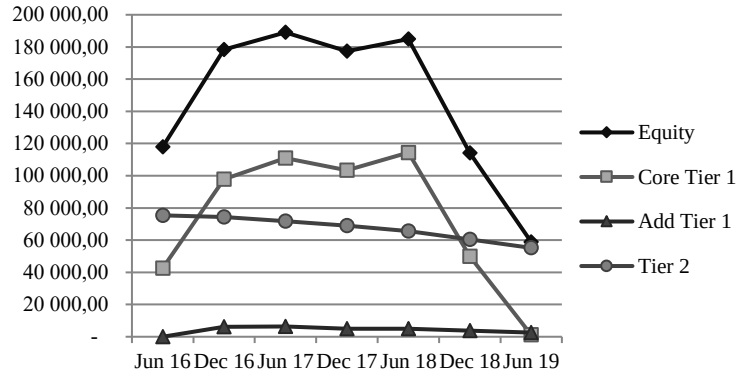

Fig. 2B

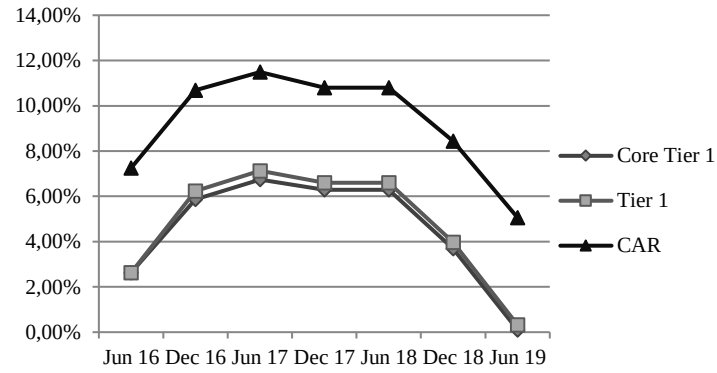

Figure 2. Capital components (Fig. 2A, in PLN thousand) and capital adequacy ratio (Fig. 2B)

Source: Author's calculations based on PBS, 2016a; 2016b; 2017a; 2017b; 2017c; 2018a; 2018b; 2019a.

3.2. The resolution process

During the preparative stage, the BFG carried out an initial valuation (Valuation 1) determining the preliminary difference in the value of the transferred assets and liabilities (the preliminary funding gap) based on limited, supervisory data published ones. This valuation prepared by an independent expert (Pricewaterhousecoopers Polska sp. z o.o. – PwC) as at 28 February 2020 presented a much worse picture of the bank, with a negative capital value of PLN –52 million.

The BFG considered that the PBS was threatened with bankruptcy and conditions for resolution were fulfilled, including that resolution was in the public interest. On 15 January 2020 the BFG made a decision to launch the resolution. According to that decision there were no indications that possible supervisory or the PBS actions would remove the risk of bankruptcy in due course. The BFG considered that the protection of liabilities to the local governments is in the public interest and in consequence is the objective to launch the resolution. All functions of the bank were suspended on January 17th and resumed on January 21st by the bridge bank[24] to which a major part of the PBS has been transferred. Based on the interim valuation (Valuation 2), also prepared by the PwC as the disposal value, the NAV was equal about PLN –180 million (finally –182.8 PLN million). The BFG decided to cancel all contributed capital, write down relevant capital instruments and apply bail-in to all the subordinated liabilities and certain non-subordinated debt (including uninsured deposits) – in the part resulting from the ratio of the estimated amount of negative equity of PLN 182.8 million less the amount of capital instruments and subordinated bonds.

The range of the bail-in was as follows:

- member shares and subordinated bonds in full,
- non-capitalised interest on amounts of funds exceeding the guarantee limit – in full,
- uninsured deposits (local government units, small and medium enterprises and other entities) – partial (42.57%).

For the purpose of verifying the NCWOL principle, a preliminary simulation of the insolvency scenario was also conducted. The difference between the losses under resolution (Valuation 2) and the hypothetical insolvency losses were calculated with PLN 413 million which means that the losses (estimated by the external expert PwC) would be about 125 % higher under hypothetical liquidation.

The application of the bridge bank in the resolution process required the use of public funds due to the need to set up its capital. Pursuant to Article 274(1)(2) of the BFG Act, BFG support cannot exceed 5% of bank's total liabilities and equities i.e. PLN 141 million. Moreover, pursuant to Article 44(4)(a) and 44(5)(a) BRRD and Article 274(1)(1) of the BFG act, in the case of discretionary exclusions of selected classes of creditors from write-offs/conversions, the use of public funds requires the write-off/conversion of 8% of the bank's own funds and liabilities i.e. PLN 227 million. The latter rule had a very serious impact on the resolution process and the bail-in scale of certain groups of depositors, which will be discussed later on. As in previous cases, the resolution tool was a bridge bank in combination with a partial bail-in. However, unlike in the Italian case, the liabilities to subordinated bond holders, including individuals, were written off in full.

[24] Bank Nowy BFG SA.

Table 2. Comparison of the balance sheet items (provided by bank and results of PwC valuations) as at February 28th 2020 (PLN million)

Specification	Data provided by the bank	Valuation 1	Valuation 2
Cash	66.6	66.6	65.6
Receivables from the Central Bank	212.1	212.1	208.6
Receivables from financial sector	160.7	157.3	154.8
Receivables from non-financial sector	1277.4	1209.0	1159.4
Receivables from government and local government entities	57.2	57.2	55.0
Securities	111.9	997.6	989.5
Fixed assets	61.1	67.6	55.7
Other assets	57.3	69.7	24.5
Total assets	**2904.3**	**2037.1**	**2713.0**
Liabilities to the Central Bank	0.0	0.0	0.0
Liabilities to financial sector	1.6	1.6	1.6
Liabilities to non-financial sector	2541.1	2541.1	2540.1
Liabilities to government and local government entities	203.7	203.7	203.7
Own issued securities	100.7	100.3	100.3
Other liabilities	38.0	38.0	23.6
Provisions	2.5	4.6	1.2
Equity	**16.8**	**–52.1**	**–179.9**
Total liabilities and equities	**2904.3**	**2837.1**	**2 713.0**

Source: BFG, 2020.

The three largest components of the PBS deposit base (representing a total of more than 90 % – see Figure 3) were deposits from individuals (virtually entirely excluded from bail-in), deposits from private companies and cooperatives and deposits from local governments and their units. It is worth recalling that the resolution objective was considering the service of local governments and their units as the critical function of the bank, due to the high value of deposits belonging to those entities. In this situation, it seemed natural to exclude these deposits from bail-in, under Article 46(3)(c) of BRRD. At that time, however, under Article 44(4)(a) and 44(5)(a) BRRD, the bail-in of the remaining available liabilities at 8% of the bank's total liabilities and own funds is a condition for using the bridging bank with capital from public funds.

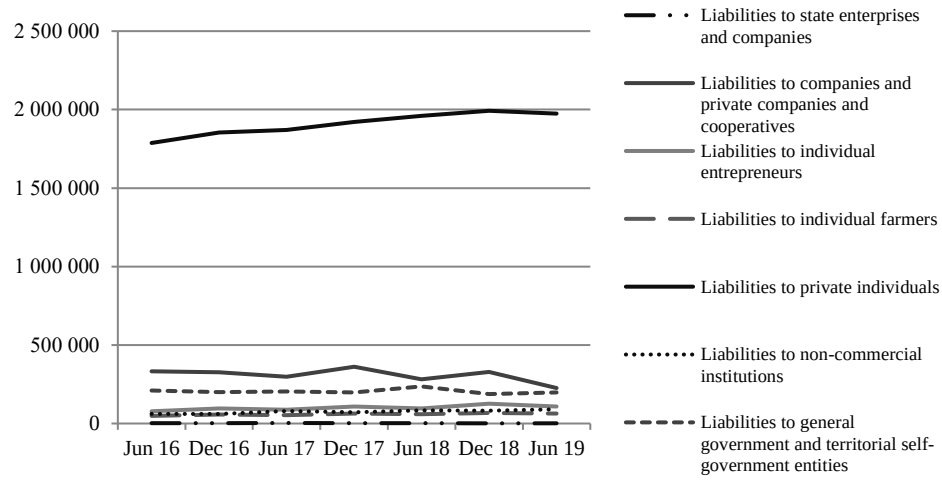

Figure 3. The deposit base (PLN thousand)

Source: Author's calculations based on PBS, 2016a; 2016b; 2017a; 2017b; 2017c; 2018a; 2018b; 2019a.

According to the information provided by the BFG [2020], that would force the write off all deposits from small and medium enterprises as well as from individuals (above guaranteed amount) for the total amount of 80 min PLN. It is highly probable that companies whose accounts would have been completely written off would have suffered a significant loss and, in addition, would have problems with liquidity, loan repayments and payment handling. This would have a strong negative impact on the region's economy. It would be also difficult to reconcile those measures with the NCWOL principle. It cannot be omitted that the loss of all funds deposited in the bank by enterprises, while fully protecting the deposits of local government units would be socially unacceptable. However in the context of the last conclusion, it is still possible to justify the adopted resolution objective. Considering that:

- in the absence of an entity willing to purchase PBS, the bridge bank combined with bail-in allowed for credible resolution using a bridge bank,
- the write-off of local government funds was aimed at reducing the scale of bail-in (both in full and in relation to the bank's other creditors)[25],
- the used funds from the from the financial arrangements (for the purpose of capitalisation of the bridge bank) will be returned after an unforced sale of the bridge bank's assets,

[25] Owners of a cooperative bank and subordinated bond holders (including individuals) lose all their investments. The other bank's creditors have been treated equally, whoever they are.

– a potential subsidy for local governments[26] from the state budget may significantly compensate for the losses incurred by local governments, leaving the state budget formally outside the formal support of the resolution,

it seems to make it likely that (as in the case of four small Italian banks and partially in case of Andelkassen), the Polish RA found a certain compromise that may be socially acceptable, by intentional bending the provisions of the BRRD, leading up to a hidden bailout by the state treasury. Apart from subordinated bonds, the bank had no other liabilities, contractually eligible for bail-in. It is likely that if 8 % of the total amount of the bank's liabilities had not had to be written off, the bail-in range applied by RA would have been significantly lower. All the cases compared indicate a discrepancy between the BRRD framework and the optimal (according to the national authority) way for a resolution of a small bank. Moreover, in each of these cases, the BRRD records were bent to justify a resolution of a very small bank (Dennmark) or a reduction in bail-in (Italy, Poland). This calls for consideration to be given to whether the BRRD in its current form really facilitates the handling of all cases of failing banks. However, any protest by local governments or other creditors of the bank should lead to a formal reduction of the bail-in scale. A change in the adopted rules as a result of pressure from creditor groups may undermine the credibility of this tool in the future. The effectiveness of bail-in will collapse if creditors are able to force state intervention. Therefore, the determination of state authorities to resist this pressure is necessary [Stopczyński 2020].

3.3. Consequences and controversy

The resolution of the PBS aroused a lot of controversy and questions about the consequences of this decision. The author limited the discussion in this publication to issues closely related to the thesis presented in this article: the moment the resolution was launched, the used tool and, the problem of individuals as subordinated bonds holders.

The value of the bank's NAV calculated as at 28 February 2019 on the basis of data provided by the bank (not to mention Valuation 1) amounted to PLN 16.9 million (see Table 1) is significantly lower than that presented in the bank's financial statements for 2018 (PLN 114 million) and for the first half of 2019 (PLN 59 million). This immediately raises the question of how the KNF assessed the bank's situation at the time and why it did not decide to launch the resolution

[26] In practice, however, this means unequal treatment of clients, as other entities cannot count on such a refund: individuals, companies and, for example, which in some sense also have public funds at their disposal (collected for church renovation).

earlier[27]. In the period preceding the resolution, the bank was very active in sponsoring cultural and sports events in the region. he bank's management had to be aware of the actual financial condition of the bank, and such behaviour has the characteristics of siphoning money out of the bank. Representatives of local governments complained about the moment of launching the resolution [Nowiny 2020]. In their opinion, in January 2020 their account balances were higher than in December 2019. The truthfulness of this information would be a significant argument for the thesis adopted by the author.

The key objectives of a bridge bank are to maintain critical financial services, ensure deposits are protected, and continue operations that are important for financial stability, minimizing disruption to the financial system [Sarra 2018]. Good practice dictates that a bridge transaction be utilized rarely and only as a short term measure to a pre-planned permanent solution for the troubled bank In some jurisdictions the bridge bank option is reserved for systemically important banks [McGuire 2012]. In this context, the choice of a bridge bank as a resolution tool for small banks is somewhat surprising, but the previous experience in EU shows that a bridge bank has been predominantly used as the resolution tool, especially in case of small banks. It indicates, the difficulty in finding an entity willing to take over the bank in its entirety or even after partial bail-in. On the other hand, recapitalisation or liquidation would lead to significantly higher costs[28]. The use of a bridge bank requires less bail-in compared to a recapitalisation and allows for an earlier use of public funds[29]. The financial arrangements are used here to create the bridge bank capital and are expected to be returned after the end of its operations. In addition, full ownership control by the state institutions provides a greater guarantee of the bank's survival than when existing creditors become bank's owners (not necessarily willing or prepared to do so). It seems also probable that the central bank will be more willing to provide liquidity support to an entity belonging to a safety net institution than to a private acquiring entity[30].

The data presented by the internet services [www1; www2] indicate that 10.6 million of the subordinated bonds issued by the bank were in the portfolios of assets

[27] Crucial is the answer to the question whether the sharp deterioration of the bank's condition actually took place in the first half of the year or whether it was only a matter of making corrections to earlier unreliable accounting records.

[28] Recapitalisation might be difficult from the legal point of view because of the need to transform the cooperative bank into a commercial bank.

[29] In the absence of any potential buyers of a failing bank (wholly or partly), the RA will choice between recapitalisation and the bridge bank. The lack of an adequate amount of liabilities eligible for write-offs or conversions to capital (MREL) is likely to impose a deep bail-in to non-guaranteed deposits.

[30] The establishment by the BFG of two other banks, predestined to play the role of bridge banks in resolution processes may indicate that the bridge bank will become the primary resolution tool in Poland.

of open-ended investment funds, of which 3.7 million in the BPS Towarzystwo Funduszy Inwestycyjnych S.A (BPS TFI) funds[31]. Although the write-off these bonds, and consequently incurring a loss by holders (or holders of TFI participation units) seems indisputable[32], it is worth posing the question whether offering such bonds to individuals was not a misselling. At present, the contagion effect in the form of lower prices of subordinated bonds issued by other cooperative banks should also be taken into account.

One of the most important is the problem of market discipline and in particular the impact of its increase (by sensitizing market participants to the situation of banks in a weaker financial condition) on the credibility of bank resolutions in the future. In the author's opinion this subject deserves a separate publication.

CONCLUSIONS AND POLICY IMPLICATIONS

One month after the launch of the PBS resolution, it is not yet possible to fully assess this process and its effects. In particular, the identification of possible contagion scale requires more time and data from other entities. However, a preliminary assessment of the presence of the public interest and the resolution mechanism used may be provided. As in Italy and Denmark, the real justification for a resolution such a small bank is to limit the losses of the bank's clients that they would suffer in the event of its bankruptcy, but the protection of retail debt holders is not a resolution objective, unless regarded as a critical function. It is likely that for this reason the formal justification is the continuation of the service of local government units, considered a critical function of the bank.

The information presented by the BFG [2020] indicates that the decision to launch resolution was made too late (what raises the issue of setting up PONV triggers by the authorities) and the process of making this decision by supervisory authority was not transparent. Actions taken sufficiently early and can ensure the continuity of critical functions, while minimizing the impact of an institution's failure on the economy and wider financial system. The information presented by the KNF [2020] is very poor and does not allow to verify which factor decided to consider that possible supervisory activities were exhausted.

The rationale for choosing bridge bank combined with the partial bail-in as the resolution tool seems to have the same basis as in other cases. The resolution authority seeks to use the resolution fund as early as possible, hoping that the unforced future sale will allow the recovery of the fund and possibly partial

[31] BPS Towarzystwo Funduszy Inwestycyjnych SA is part of the BPS Group, the largest association of Cooperative Banks in Poland. Bank Polskiej Spółdzielczości SA is 100% shareholder.

[32] However some investors were probably largely unaware of the true risk associated with these products, not even being aware of their bondholder status.

recompense of the creditors whose liabilities have been written off. In this context, the bail-in of deposits from local government units has served as an instrument to protect other creditors of the bank from excessive losses. However, the reaction of the local governments indicates that they were unaware of the role assigned to them. It is not excluded that their losses will be compensated by the State budget (in the manner that does not allow to recognize a direct link with PBS resolution).

The concept of bank resolution was designed as an attempt to find an antidote to the Too Big To Fail bank problem. This concept was later extended as a way of dealing with all failing banks. The previous cases of resolution of small banks in the EU indicate that national resolution authorities, fearing the effects of a potential contagion (or protecting the finances of the local community), see the need to avoid the bankruptcy of small, local banks, and made a decision to trigger resolution when such banks become insolvent. At the same time, resolution authorities seek to limit the scope for bail-in and try to use the financial arrangements (resolution fund), facing the dilemma of following the BRRD provisions or bending the rigid rules of the Directive to use public funds at an early stage. In this context the resolution of PBS seems to be credible however not an example of good practice described by BRRD and other EU regulations[33]. It is rather an illustration of bending existing regulations in order to resolve banks in a socially accepted manner. This raises the issue whether the current regulations are not too rigid and may in the future impose ineffective or socially unacceptable solutions and the need of empirically monitoring bail-in, and more general, the application of the BRRD.

BIBLIOGRAPHY

Act of BFG, 2016, Ustawa o Bankowym Funduszu Gwarancyjnym, systemie gwarantowania depozytów oraz przymusowej restrukturyzacji z dnia 10 czerwca 2016 r., Dz.U. 2017, poz. 1937 z późn. zm.; Dz.U. 2019, poz. 326, tekst jednolity z dnia 15 marca 2019 r., Dz.U. 2019, poz. 795.

Acharya V.V., Yorulmazer T., 2007, *Too many to fail – An analysis of time-inconsistency in bank closure policies*, „Journal of Financial Intermediation", vol. 16, issue 1, pp. 1–31, ISSN 1042-9573.

Asimakopoulos I.G., 2018, *The Veneto Banks Resolution: It Shall Be Called Liquidation*, „European Company Law Journal", vol. 15, no. 5, pp. 156–162.

[33] On the basis of these regulations, we are still in a transitional period and it is only when banks have sufficient loss absorbing capacity (sufficient amount of liabilities contractually eligible for bail-in) that the uncertainties with regard to the potential bail-in scale will be removed. On the other hand the evidence of „unusual cases" shows the necessity to introduce other measures to deal with the failing banks and practical challenges encountered when applying bail-in.

Avgouleas E., Goodhart Ch., 2015, *Critical Reflections on Bank Bail-ins*, „Journal of Financial Regulation", vol. 1, pp. 3–29.

Banca d'Italia, 2017, Cassa di Risparmio di Ferrara, Banca delle Marche, Cassa di Risparmio della Provincia di Chieti e Banca Popolare dell'Etruria e del Lazio, Audizione di Carmelo Barbagallo, https://www.bancaditalia.it/media/notizia/cassa-di-risparmio-di-ferrara-banca-delle-marche-cassa-di-risparmio-della-provincia-di-chieti-e-banca-popolare-dell-etruria-e-del-lazio/

Benink H.A., 2018, *Raising bank loss absorption capacity through equity capital or bail-in debt: A perspective from Europe*, „Journal of Financial Economic Policy", vol. 10(2), pp. 275–280.

Bernard B., Capponi A., Stiglitz J.E., 2017, *Bail-ins and Bail-outs: Incentives, Connectivity and Systemic Stability*, NBER Working Paper No. 23747.

BFG, 2020, *Przymusowa restrukturyzacja Podkarpackiego Banku Spółdzielczego w Sanoku – informacja rozszerzona*, https://www.bfg.pl/przymusowa-restrukturyzacja-podkarpackiego-banku-spoldzielczego-w-sanoku-informacja-rozszerzona/

Boccuzzi G., De Lisa R., 2017, *Does Bail-in Definitely Rule out Bailout?*, „Journal of Financial Management Markets and Institutions", vol. 5(1), pp. 93–110.

BRRD (Bank Recovery and Resolution Directive), 2014, Directive 2014/59/EU of the European Parliament and of the Council of 15 May 2014 establishing a framework for the recovery and resolution of credit institutions and investment firms and amending Council Directive 82/891/EEC, and Directives 2001/24/EC, 2002/47/EC, 2004/25/EC, 2005/56/EC, 2007/36/EC, 2011/35/EU, 2012/30/EU and 2013/36/EU, and Regulations (EU) No. 1093/2010 and (EU) No. 648/2012, of the European Parliament and of the Council.

Dewatripont M., 2014, *European banking: Bailout, bail-in and state aid control*, „International Journal of Industrial Organization", vol. 34, pp. 37–43.

EBA, 2019, *Handbook on valuation for purposes of resolution*, https://eba.europa.eu/eba-publishes-handbook-on-valuation-for-purposes-of-resolution

Finansiel Stabilitet, 2015, *Decision of Finansiel Stabilitet (Denmark)*, https://eba.europa.eu/regulation-and-policy/recovery-and-resolution/notifications-for-use-of-dgs-funds/denmark/andelskassen-j.a.k.-slagelse

Finansiel Stabilitet, 2018, Notification from Finansiel Stabilitet, https://eba.europa.eu/file/33151/download?token=hqoeGbnf

FSB, 2014, *The Key Attributes of Effective Resolution Regimes for Financial Institutions (the 'Key Attributes')*, 15 October.

Geithner T.F., 2014, *Stress Test: Reflections on Financial Crises*, Random House, 306.

KNF, 2020, *Stanowisko Urzędu KNF ws. oświadczenia Rady Nadzorczej w zawieszeniu Podkarpackiego Banku Spółdzielczego z siedzibą w Sanoku*, https://www.knf.gov.pl/knf/pl/komponenty/img/Stanowisko_UKNF_ws_oswiadczenia_RN_w_zawieszeniu_PBS_w_Sanoku_68664.pdf

Lintner P., Lincoln J., 2016, *Bank Resolution and Bail-In in the EU: Selected Case Studies Pre and Post BRRD*, World Bank Group, http://documents.worldbank.org/curated/en/100781485375368909/Understanding-bank-recovery-and-resolution-in-the-EU-a-guidebook-to-the-BRRD

Miklaszewska E., 2017, *The application of bail-in tool in a bank resolution framework: The evidence from the Italian local and regional banks*, „Bezpieczny Bank", vol. 4(69), pp. 168–182.

McGuire C., 2012, *Simple tools to assist in the resolution of troubled banks*, World Bank, http://documents.worldbank.org/curated/en/271191468330277052/simple-tools-to-assist-in-the-resolution-of-troubled-banks

Nowiny, 2020, https://nowiny24.pl/samorzadowcy-z-podkarpacia-ktorzy-stracili-pieniadze-z-banku-pbs-mowia-dosc-i-zaczynaja-walczyc-o-rekompensaty-od-rzadu/ar/c1-14751430

Pandolfi L., 2018, *Bail-in vs. Bailout: a False Dilemma?*, CSEF – Centre for Studies in Economics and Finance, Department Of Economics, University of Naples, Working Paper No. 499, May.

PBS, 2017a, *Sprawozdanie Zarządu z działalności Podkarpackiego Banku Spółdzielczego za 2016 r.*

PBS, 2017b, *Sprawozdanie Zarządu z działalności Podkarpackiego Banku Spółdzielczego za I półrocze 2017 r*.

PBS, 2018a, *Sprawozdanie Zarządu z działalności Podkarpackiego Banku Spółdzielczego za 2017 r.*

PBS, 2018b, *Sprawozdanie Zarządu z działalności Podkarpackiego Banku Spółdzielczego za I półrocze 2018 r*.

PBS, 2019a, *Sprawozdanie Zarządu z działalności Podkarpackiego Banku Spółdzielczego za 2018 r.*

PBS, 2019b, *Informacja dodatkowa sprawozdania finansowego Podkarpackiego Banku Spółdzielczego za okres od 1 stycznia 2018 roku do 31 grudnia 2018 r*.

PBS, 2019c, *Sprawozdanie Zarządu z działalności Podkarpackiego Banku Spółdzielczego za I półrocze 2019 r*.

Sarra J., 2017, *A Bridge Over Troubled Waters – Resolving Bank Financial Distress in Canada*, „Annual Review of Insolvency Law" (Carswell, Toronto), pp. 255–342.

Schäfer A., Schnabel I., Weder di Mauro B., 2016, *Bail-in expectations for European banks: Actions speak louder than words*, ESRB Working Paper Series, No. 7, April.

Stopczyński A.R., 2020, *Banki na progu upadłości – refleksje nad postępowaniem*, article accepted for printing by „Bank i Kredyt" (to be published in May 2020).

Tröger T.H., 2017, *Why MREL won't help much: Minimum requirements for bail-in capital as insufficient remedy for defunct private sector involvement under the European bank resolution framework*, SAFE Working Paper, No. 180, Goethe University Frankfurt, SAFE – Sustainable Architecture for Finance in Europe, Frankfurt a. M.

White Ph., Yorulmazer T., 2014, *Bank Resolution Concepts, Trade-offs, and Changes in Practices*, „Economic Policy Review", vol. 20(2).

[www1] www.obligacje.pl

[www2] www.stockwatch.pl

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THE EFFECTIVENESS OF THE TRANSACTION SYSTEMS ON THE DAX INDEX

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Abstract

The purpose of the article/hypothesis: The aim of this article is to examine the effectiveness of trading systems built on the basis of technical analysis tools in 2015–2020 on the DAX stock exchange index. Efficiency is understood as generating positive rates of return, taking into account the risk incurred by the investor, as well as achieving better results than passive strategies. Presenting empirical evidence implying the value of technical analysis is a difficult task not only because of a huge number of instruments used on a daily basis, but also due to their almost unlimited possibility to modify parameters and often subjective evaluation.
Methodology: The effectiveness of technical analysis tools was tested using selected investment strategies based on oscillators and indicators following the trend. All transactions were carried out on the Meta Trader 4 platform. The analyzed strategies were comprehensively assessed using the portfolio management quality measures, such as the Sharpe measure or the MAR ratio (Managed Account Ratio).
Results of the research: The test results confirmed that the application of described investment strategies contributes to the achievement of effective results and, above all, protects the portfolio against a significant loss in the period of strong turmoil on the stock exchange. During the research period, only two strategies (Ichimoku and ETF- Exchange traded fund) would produce negative returns at the worst possible end of the investment. At the best moment, however, the „passive" investment achieved the lowest result. Looking at the final balance at the end of 2019, as many as four systems based on technical analysis were more effective than the „buy and hold" strategy, and at the end of the first quarter of 2020 – all of them. When analyzing the management quality measures, it turned out that taking into account the 21 quarters, the passive strategy had the lowest MAR index. The Sharpe's measure is also relatively weak compared to the four leading strategies.

Keywords: technical analysis, trading systems, DAX index, stock exchange, investment strategies.

JEL Class: G11, G14, G15, O24.

INTRODUCTION

Technical analysis is one of the oldest areas of market science although many investors and academics see it as a useless tool in making investment decisions, and even as „reading tea leaves" or a self-fulfilling forecast. Meanwhile, one of the fundamental aspects of technical analysis is the study of market behavior by using charts to predict future price levels in the light of rapidly changing human perception, which determines quick actions that would not be possible using only the fundamental analysis. In order to fully appreciate the technical analysis, it is first of all necessary to understand its assumptions, which are based on three rational pillars. The first one tells us that the market discounts everything. This means that all political, fundamental or psychological factors affecting the market price of a commodity are fully reflected in the price of that commodity, and therefore, studying price behavior is a self-sustaining approach. Perhaps this approach seems to be an oversimplification, but after much reflection it is hard to disagree with it. The second premise is that prices are trending. Studying the charts comes down to identifying trends at an early stage, enabling us to trade in line with their direction. Moreover, trends tend to continue running in the current direction, rather than change, until there are significant signs of a possible reversal. The third pillar is based on patterns proven in the past and is based on the study of the human psyche, which remains unchanged. This means that history likes to repeat itself, so an important factor in understanding the future is the proper analysis of historical quotations [Murphy 1995: 2–4]. Technical analysis has many strengths, but limitations as well. A big plus is the fact that it is based on historical data such as prices, volume or a number of open positions. This information is publicly available, which allows market participants to relatively easily translate it into a chart and analyze it. Thanks to the above data, it is possible to determine not only the liquidity of a given stock, but also to set support and resistance levels as well as trend lines. Moreover, technical analysis is a universal method, regardless of whether we study the market of raw materials, shares, currencies or precious metals. Another advantage is the application for any investment horizon although it is the most popular among short-term players. Contrary to the fundamental analysis, specialist knowledge on the interpretation of financial statements is also not required, which, when using creative accounting or placing given assets or liabilities in a different category, may have a negative impact on the company's reliable valuation.

Critics of technical analysis point out the lack of correlation between historical and future prices. As a result, the tools used in the past do not have to prove useful in the future, leading investors to lose trades [Pająk 2013: 132–134].

In some situations, we also receive contradictory information that is mutually exclusive – namely, one indicator gives a sell signal and the other gives a buy

signal, which makes it difficult to take a position on the right side of the market. Among the disadvantages (or perhaps advantages?) of the analysis, there is also a significant element of subjectivism, while the fundamental assessment of values is related to the interpretation of economic and financial data. Meanwhile, the subjective approach leads to a heuristic error, called the „backward thinking effect". For this reason, the layouts on the chart play out completely differently in retrospect than at the time of trading [www5, access 2.02.2020]. The article consists of the following parts: introduction, the theoretical part in which the researched investment strategies are described, and then the empirical part in which the effectiveness of a total of six transaction systems built on the basis of technical analysis was checked, using two selected measures of portfolio management quality, i.e. the Sharpe indicator and MAR, and then additionally compared the previously tested six trading systems with the passive „buy and hold" strategy also using the Sharpe and MAR ratios. The article ends with conclusions of the conducted study.

1. CONSTRUCTION OF TRANSACTION SYSTEMS

Many novice investors are looking for a magic indicator that will allow them to multiply their capital. When it starts to work, they feel as if they have discovered the Holy Grail and the path to success seems simple. The reality can be quite different, however, as markets are too complex to be analyzed using only one measure. Hence, this article will examine six trading systems created on the basis of technical analysis, such as: 1) the strategy of moving averages and ADX indicator; 2) MACD and Parabolic SAR strategy; 3) the strategy based on RSI and Bollinger bands; 4) Ichimoku Kinko Hyo Technique; 5) the strategy using Commodity Channel Index and Donchian Channel; 6) the strategy based on the stochastic oscillator and the Keltner Channel, and then comparing them with the passive strategy, i.e. „buy and hold". Before these strategies were compared by using the Sharpe index and MAR, the structure of the analyzed strategies is presented below.

1.1. Moving averages strategy and ADX indicator

Each investment strategy requires not only setting a convenient entry point, but also an exit from the position in order to properly manage risk. Moving averages are used to detect long-term trends as well as day trading. They smooth out market vibrations and short-term volatility of quotations, which allows us to identify where the market is heading. On the other hand, they do not work for

consolidation, generating many wrong signals. They also do not measure the strength of the current trend [LeBeau and Lucas 1998: 90–92].

One of the simplest and one of the most effective systems is the one moving average system. The buy signal occurs when the rate crosses the average line from the bottom, and the sell signal occurs when the rate crosses the average line from the top. It is a simple system that implies a continuous presence on the market, but it is worth using additional filters [LeBeau and Lucas 1998: 96–97; Borowski 2019]. However, the system based on two averages is used more often. Various combinations of N values are possible, e.g. 3- and 12-period mean or the popular Richard Donchian system based on 5 and 20 periods. The principle of using averages is simple: we buy when the shorter average (faster) crosses the slower average from the bottom. We do the opposite while opening a short position.

In order to build a better and more comprehensive system, it is worth adding the Directional Movement Index (DMI) to the moving averages. The structure of the system was proposed by J. Welles Wilder in the 1970s. The method not only identifies the current trend, but also provides information whether it is fast enough to be worth following. The DMI indicator consists of three lines [www16, access 27.02.2020]:

- ADX (Average Directional Movement Index),
- DI+ (Directional Indicator +),
- DI– (Directional Indicator –).

Directional movement is the range of price fluctuations in a given period that is outside the extremes of the previous period. For example, if today's price range is above yesterday's, then the directional movement is positive (+DM), if below negative (–DM). If today's trading range is within yesterday's range or is symmetrically above and below it, then DM = 0 (no movement). After determining the directional movement, it is necessary to calculate – swing range – the so-called true range. TR is the largest of the three values::

- the difference between today's – maximum and minimum or
- today's maximum – and yesterday's closing price
- today's minimum and yesterday's closing price.

To calculate the daily directional indicators (+DI) and (–DI), divide (+/–) the DM by the TR, thanks to which the directional traffic is presented as a percentage value in relation to the range of fluctuations on a given day. Subsequently, the lines should be smoothed using e.g. a 13-day moving average. When +DI13 is above –DI13 we are dealing with an uptrend, if it is below – with a downtrend. Buy or sell signals are generated when the lines cross. At the end, the ADX (smoothed DX) indicator is calculated, which goes up when prices are moving in one specific direction [Elder 2018: 136–138]. The DX directional index is determined by the following formula:

$$DX = \frac{(+DI13 - -DI13)x100}{+DI13 + -DI13}$$

In the literature, the value of the ADX indicator below 20 points is considered a weak trend, therefore, other indicators should be used. As the ADX level rises, traders should be driven by trend following systems (e.g. moving average). A reading above 45 points indicates a very strong trend and increases the probability of a correction [Borowski 2018: 127].

The ADX can be used as a filter with a strategy based on two moving averages or the crossing of the +DI and –DI lines, which can also be used to play against the trend. A sell signal appears when the +DI line reaches extremely high values (e.g. 40 points) and the –DI line shows extremely low values (below 10 points) [www12, access 27.03.2020]. The disadvantage of the ADX indicator is that it only starts to increase after the + DI and –DI lines intersect.

1.2. MACD and Parabolic SAR Strategies

Indicators, commonly called oscillators, allow you to pinpoint the stage of a trend and pinpoint the moment when the trend loses its momentum. They have been applied in technical analysis because they express the pace at which market prices change. Strong momentum suggests a healthy trend, a weak one warns that the price movement may end. Extreme momentum values can accompany short-term depletion moments, showing overbought or oversold conditions, which increases the likelihood of a correction.

The MACD indicator is primarily popular with traders because of its great flexibility as a tool to play with and against the trend. It was constructed by Gerald Apple and presents the difference of two exponential moving averages (12 and 26 EMA) together with a 9-period mean of this difference, which is the signal line. The result is a smooth oscillator with a wide range of applications. Trade opening signals are generated by breakout of the zero line, crosses of the signal line, oversold and overbought situations as well as divergences. The convergence and divergence of the moving averages reflect the approaching or receding of the averages depending on the speed and changes in the direction of the rates [Etzkorn 1999: 33].

The sell signal is generated when the MACD fast line crosses the signal line from above, both of them being positive. The signal is all the more important the higher the intersection above the zero line occurs. Thus, breakthroughs below line 0 should be ignored. A buy signal will appear in the opposite way. Similarly, the lower the intersection below the 0 line, the more reliable it is. It should also be remembered that, unlike other oscillators such as the RSI or the stochastic

oscillator, the Moving ACD has no lower or upper fluctuation limits [Bar 2001: 108–109].

The MACD is an indicator of an auxiliary nature and its application should be subordinated to the basic trend analysis. It can generate a lot of false signals in the initial phase of a trend, so it is better suited at the end of mature trends. Such information can be provided by a positive or negative divergence. For example, a negative divergence occurs when the MACD lines are well above the 0 level and begin to decline while prices continue to hit new maximus. This is often a warning that a price peak is forming [Murphy 2017: 232].

The strategy may be complemented by the Parabolic Stop and Reversal indicator developed by Wells Wilder, which performs very well in clear vertical trends. The PSAR is obviously an indicator of the prevailing trend direction, but it also proves to be useful in targeting levels of defense orders. It is rarely used as a single tool, but usually in building simple trading systems in conjunction with oscillators [www7, access 30.03.2020]. The very name of the indicator comes from the arrangement of dots placed above and below the prices of the instrument, the shape of which resembles a parabola. To calculate the value of the indicator, the following recursive formula is adopted [www2, access 28.02.2020]:

$$PSAR_t = PSAR_{t-1} + AF_{t-1} \times (EP_{t-1} - PSAR_{t-1}),$$

where:
PSARt – the value of the Parabolic parameter at time t,
AF – the acceleration factor that increases when a new high is reached for long positions or a new low is for short positions. Wilder's proposed value is 0.02, increasing in 0.02 steps until it reaches 0.18–0.21,
EF – lowest or highest price recorded in the current trend.

It should be remembered that in a sideways trend the indicator is practically useless. Then it provides delayed signals, which, due to the low volatility of price movements, makes it difficult to conduct profitable transactions [Borowski 2017: 114].

In the above strategy, the condition for opening a long position is that the MACD indicates an uptrend and the position of the parabolic dot under the price. Conversely, in case of opening a short position the parabolic should be above the price and the MACD oscillator should indicate a downward movement. In addition, traders often use the PSAR as their stop loss level, which is set at the last dot. When the trend accelerates, the dots begin to move away from each other, which allows us to hedge unrealized gains.

1.3. Strategy based on RSI and Bollinger Bands

Another strategy commonly used in the financial markets consists of the Relative Strength Index (RSI) oscillator and Bollinger bands. This is one of the contrarian strategies because it involves opening positions against the current trend despite the famous saying among traders – „the trend is your friend".

The RSI belongs to the group of momentum indicators which inform investors about the strength and maturity of the current market trend. It was developed by the aforementioned J.W. Wilder in the 1970s. The indicator illustrates the relationship between upward and downward movements in closing prices in a given period, and then normalizes the results so that the index values vary between 0 and 100. The methodology for calculating the RSI value is defined by the following formula [Nowakowski 2003: 58]:

$$\text{RSI} = 100 - \frac{100}{1+\left(\frac{\text{Ui,n}}{\text{Di,n}}\right)},$$

where:

$\frac{\text{Ui,n}}{\text{Di,n}}$ = (average of positive price changes in n sessions) / (average of negative price changes in n sessions).

A quotient of sums can also be used instead of quotient of means. Wilder himself proposed exponential means although analysts use other averages as well. Most often, 9, 14 or 21 periods are taken as n, and the longer the period, the fewer signals the oscillator generates. When making investment decisions while taking into account the RSI, investors pay attention to emerging divergences and levels of oversold and overbought. Divergence occurs when the RSI starts to decline despite further price increases and the next peak of the indicator is below the previous one. Usually, the overbought level is defined when the index exceeds 70, but during a bull market, the value of 80 can also be adopted. The oversold zone is bounded by the level of 30 or 20 points [Czekała 1997: 57].

When an indicator enters an overbought or oversold zone, it is a warning signal of a possible trend reversal, but relying solely on the relative strength index can lead to huge losses. This is because in a bullish or bearish period, the RSI is often in the overbought or oversold zone for a long time, so it is important to use it in conjunction with another technical analysis tool [Czekała 1997: 59]. The oscillator gives quite good signals when a given value is in a horizontal trend. In this case, a buy signal is generated when the indicator rises above the oversold level, and a sell signal is generated when the index drops below the overbought level.

Unlike most indicators, Bollinger Bands is not a static indicator and changes its shape based on recent prices and accurate measurement of momentum and volatility. The very mechanism of this tool is relatively simple. The middle line is a moving average, usually calculated for the closing prices of subsequent sessions. The other two lines are separated by a certain number of standard deviations of quotations for the adopted period. Typically a 20-period moving average and two standard deviations are used. These are not randomly established parameters as they have strong statistical foundations. The three-sigma law tells us that 68.2% of the observations are within +/– 1 deviation from the mean, while among the 2 deviations the probability increases up to 95.4%. In the range of 3 deviations, it is 99.7% of observations [www1, access 3.03.2020].

In periods when the market is in a sideways trend, it should move between extreme bands. Reaching the bottom line is then treated as a buy signal, conversely, a sell signal appears near the upper band. As the volatility increases, the bands will deviate more and more from the moving average. Additionally, while setting the standard deviation, multiplicity parameter at the level of 2.5 results in the fact that the price reaches the lower or upper band less often, which makes the meaning of such a signal more reliable [Kochan 2009: 208–209].

A lot of information from Bollinger Bands can be used to analyze the strength of a trend. During strong trends, the price stays close to the low or high line, and a pullback when the trend continues indicates a weakening momentum. On the other hand, repeated attempts to get the course close to the outer rim, which fail – signal a lack of strength [www8, access 2.04.2020].

The strategy based on the Bollinger bands and the RSI oscillator generates a sell signal when the price reaches the upper band and is rejected there, while the relative strength index is in the overbought zone. The occurrence of divergence may also be an additional confirmation. A buy signal is generated inversely. We buy when the price bounces from the bottom line and the RSI oscillator shows a value below 30. The unquestionable advantage of the strategy is the combination of the leading indicator (RSI) with the lagging indicator (BB). The disadvantages include the fact that if you rely on a contrarian strategy, without the proper setting of defense orders, you can suffer severe losses. Corrective movements are shallower than directional movements, which limits their potential.

1.4. Ichimoku Kinko Hyov Technique

This strategy that literally translates to „one glance equilibrium chart" was developed in 1968 by Goichi Hosoda. Ichimoku and consists of 5 lines [Bąk 2015: 36]:

- *conversion line – tenkan sen,*
- *base line – kijun sen,*
- *lagging line – chikou span,*
- *leading span A - senkou span A,*
- *leading span B – senkou span B.*

The *conversion line* is the average of the high and low over the last 9 periods (e.g. the last 9 day candles). Usually, it is closest to the current price and sets the first support or resistance level when a correction occurs.

Kijun sen is calculated in the same way as *tenkan sen*, but takes into account the last 26 periods. After the return line, it is another, but definitely stronger, resistance or support.

The *chikou span* is a line that represents the current closing price but shifted back 26 periods. The principle is as follows: when it is above the price, it is an uptrend, if below the price – it defines a downward trend. The delayed line does not generate trading signals, but is a perfect complement to other indicators [www14, access 15.03.2020].

The first of the lines forming the so-called *Ichimoku (Kumo)* cloud is *senkou span A*. It is calculated by adding tenkan and *kijun* values together, then dividing the sum by 2 and shifting it forward 26 periods, whereby it is classified as a leading indicator. In other words, it provides information about the future potential behavior of the course. The second line, *senkou span B*, is the result of calculating the average of the maximum and minimum 52 candles and also shifting by 26 periods forward. The area between them is called the cloud, and depending on which *senkou* line is higher, it is called an upward or downward cloud. Span B often remains flat. *Kumo* provides the investor with a lot of information. The cloud can be rising (Span A above Span B) and falling (Span A below Span B). The thickness of the cloud is also important. The thicker it is, the less likely it gets that the rate will break its level and the current trend will be reversed. Moreover, it works very well as support and resistance levels [Elliott 2007: 36–40].

A strategy based on the first two lines can generate three signals: strong, neutral and weak. A strong buy signal is generated when *tenkan sen* pierces from below the *Kijun sen* above the cloud. A similarly strong sell signal occurs when *tenkan sen* crosses the top of the *kijun sen* below the *kumo*. Neutral is observed when the lines intersect within the cloud. It shows that investors are indecisive and the rate may exit from consolidation both upwards and downwards. A weak buy signal occurs when the cross occurs below the cloud, which is treated as a strong price resistance. The interpretation of the line arrangement is the same as in the case of the strategy based on two moving averages. Another impulse for stock exchange players is the price going out of the cloud. Long positions should be opened when the candle closes above the cloud. Conversely, we open short

positions – when the candle's closing is below the *kumo*. The third buy signal is the behavior of the *chikou span* line with respect to price. If the lagging line crosses the price or goes above it, it confirms the current uptrend in the market. Therefore, we do not buy when the *chikou span* is below the rate. Similarly, we do not open positions when candles are drawn in the cloud range, as this proves that the consolidation prevails on the market [Oziemczuk 2011: 61–63].

Therefore, the strongest buy signal is to take a long position when three conditions are simultaneously met: 1) *Tenkan sen* crosses *kijun sen* from the bottom above kumo; 2) the rate will go above the cloud (the higher the more reliable the break); 3) *Chikou span* is above the price.

The *Ichimoku* technique is applicable in all financial markets: stocks, bonds, commodities, currencies or indices [Borowski 2001: 3].

1.5. Strategy using the Commodity Channel Index and the Donchian Channel

The CCI oscillator was created by Donald Lambert and first described in 1980. Initially, it gained the popularity mainly on commodity markets, but over time it began to be used also in other markets. The indicator is used to trade with the trend, but because it acts like an oscillator, it can also be used to identify turning points [Frierdich 2013: 256].

CCI is based on a mathematical formula, the result of which is a value that expresses the statistical distance between the price of a given asset and a moving average. When the distance is relatively large, we assume that a trend has formed, and we open a position in its direction. The formula for calculating the CCI value is as follows [www3, access 24.04.2020]:

$$\text{CCI} = (\text{typical price} - \text{moving average}) \,/\, (0{,}015 \times \text{mean deviation})$$

According to the author's concept, a typical price is nothing more than the arithmetic mean of the following three values: highest, lowest and closing. As for the moving average, it was originally calculated on the basis of 20 periods, but is now more and more often based on 14 periods. In the denominator, Donald Lambert took the constant value of 0.015 so that most of the observations fell in the range of –100 to +100. The CCI can therefore be positive or negative. The author of the indicator signaled the opening of long positions when the oscillator exceeded +100 points and their closing when it fell below this round limit. On the other hand, short positions should be concluded after exceeding the level of –100 points and closed when returning to the –100 line. This approach, however, has quite a significant disadvantage, namely overlooking the entire initial phase of the emerging trend. Therefore, in the literature, we can meet with recommendations

to open long position after breaking the 0 level from the bottom and the short position after crossing from the top [www13, access 15.04.2020].

The formula of the Donchian Channel is relatively simple. The upper band is the maximum, and the lower band is the minimum of the last n periods. The presumed value of the n parameter on most trading platforms is 20, but it can be modified depending on the investment horizon and the financial instrument. As a rule, a buy signal is generated when the rate is above the current level of the upper band. Short positions should be opened when the price is below the most recent reading of the lower band of the channel. Therefore, the Donchian-based trading system assumes that positions should be concluded when a significant support or resistance breaks. If we want to trade on the basis of the arithmetic mean of external bands, the trading signals are analogous to the moving average [www17, access 28.03.2020].

An exemplary trading system based on the CCI and Donchian Channel may generate a buy signal when the rate breaks the upper limit of the channel and the CCI exceeds the 100 points limit. To capture most of the traffic, it is enough for the CCI to show a positive value, but this reduces the reliability of the indicator.

1.6. Strategy based on the stochastic oscillator and the Keltner Channel

In spite of the fact that the very word „stochastic" refers to the randomness that every investor tries to avoid in analyzing financial markets, the stochastic oscillator is one of the most widely used tools. It was developed by George Lane in the late 1950s. The stochastic oscillator concept assumes that during a strong upward trend, closing prices will run around the highs recorded during a given session, while in a downtrend – near lows. Similar to the RSI, the tool identifies overbought and oversold levels, indicating the exhaustion or potential of the current trend. The indicator is constructed using two lines – %K and %D. The first of them is the so-called the „fast oscillator", the second – is known as „slow oscillator". The %K line measures the strength of a price movement compared to the price range over a given period. To calculate the value of the fast %K oscillator, you need to calculate the difference between the last closing price and the minimum price from e.g. the last 5 sessions. We divide the obtained result by the difference between the highest and the lowest value recorded during the tested interval (in this case 5 sessions). In order to get a value from 0 to 100, the quotient is multiplied by 100. The levels of overbought and oversold are defined in the same way as for the RSI oscillator, so we need the second %D line to refine the indicator. There is a 3-period simple moving average of the %K line and is most often shown as a dotted line on trading platforms. Using both lines we get a more reliable indicator that generates buy and sell signals every time the %K line

crosses the %D line. The best signals are in the oversold or overbought zone. A long position should be open when, in the oversold zone, the %K line crosses the %D line from the bottom. A short position, on the other hand, when the %K line crosses the %D line from the top at overbought levels. Analyzing the course of a stochastic oscillator can also provide other valuable information, such as a bullish or bearish divergence. We encounter the former when prices set lower and lower lows, while the stochastic begins to rise. If the stochastic oscillator goes down when prices start to rise, it is a bearish divergence. In both situations, a warning appears about a possible reversal of the current trend [Rockefeller 2012: 267–270].

The author of the second indicator is Chester Keltner, known as a commodity trader. While the Keltner Channel may resemble the more well-known Bollinger Bands in the technical analysis theory, in reality its use and design differ from the Bollinger Bands described above. The main difference is that the outer bands do not rely on standard deviation but use a different measure of volatility, which is ATR – Average True Range, developed by J. Wilder. So the price swing range is just a number, so we need to average the TR over several days to get the ATR. The increase in this indicator tells us about the greater volatility in the market. For his calculations the author of the tool used the 14-session moving average [Jabłoński 2006: 32].

Returning to the design of the Keltner Channel, however, the middle line is the 20-day exponential moving average. To plot the lower and upper band, we subtract and add the ATR value multiplied by the coefficient, which, according to the literature, should be 2 although it can be modified for a given instrument. The greater the value of the coefficient, the wider the channel and vice versa. Investors use the Keltner Channel in two ways. The first one involves playing „from band to band" and works best during consolidation. The second way is to open a position after breaking the outer band, which confirms the strength of the current trend. When the price closes over the high band, a buy signal is generated. When the price closes below the lower band, we open short positions [www15, access 20.03.2020]. However, the breakout strategy should be supplemented with e.g. ADX.

The above strategy based on the stochastic oscillator and the Keltner Channel may suggest opening a long position when in the oversold zone the %K line breaks the %D line from the bottom and the price broke below the bottom band of the channel and starts to come back to it. Short – when the %K line crosses the top of %D in the overbought zone and the price is above the upper band of the channel.

The trading systems described above are examples of technical analysis indicators that can be freely modified not only in terms of the size of the parameters, but also their skillful replacement.

2. TESTING OF TRADING SYSTEMS ON THE DAX STOCK INDEX

DAX (*Deutscher Aktienindex*) is the main German stock index, which includes 30 largest companies whose total capitalization accounts for nearly 80% of all companies listed on the German stock exchange. Its components include such companies as Adidas, Deutsche Bank, Lufthansa, Volkswagen, Bayer and Siemens. While calculating the value of the index not only is the increase in prices taken into account but also dividends paid, so unlike the Polish WIG20, it is a return index. The first quotations date back to July 1, 1988, from the level of 1163.52 points, setting the base of 1000 points as of December 31, 1987 [www6, access 10.04.2020].

The index itself is not an asset that can be bought directly. Other investment alternatives based on the DAX index can include CFDs (their price may depend directly on the value of the index or futures contract), options or replication of the company's portfolio in appropriate proportions.

2.1. Research methodology

Due to the specificity and rolling over of subsequent series of futures contracts, the study will be conducted on an index-based CFD. For the standardization of calculations, the value of one point is EUR 25, i.e. as much as the multiplier of the futures contract. The scope of the test covers the quotations from the beginning of 2015 to March 30, 2020, thanks to which the period of the outbreak of the coronavirus pandemic will also be taken into account, during which the market experienced huge turbulences.

All transactions were carried out on the Meta Trader 4 platform using the simulator provided by the Admiral Markets broker. Trading on the simulator is carried out in the same way as on the real market in real time, therefore *backtesting* allows for quite an effective confrontation with the market. After the test is completed, a report is generated and it shows a lot of additional data, such as the number of profitable and losing positions or the capital curve during the investment period. In addition, the sample report includes:

– Total net profit – the final result of all transactions, calculated as the difference between „gross profit" and „gross loss";
– Gross profit – sum of all profitable items;
– Gross loss – the sum of all losing positions;
– Profit ratio – quotient of gross profit and gross loss;
– Expected profit – a parameter reflecting the statistical average of the profit /loss ratio for one transaction;

– The curve of capital – that is reflected in the account balance during the life of the investment.

The overall results presented in the reports allow for a quick overview of the results of individual strategies.

Each of the transactions was concluded on the basis of the chart analysis on the daily interval. The spread, i.e. the difference between the bid and ask price, was 1 point, which corresponds to the offer made by most brokers. The negative swap points that are charged daily as a cost-holding for index based CFDs are included in the trading results. Moreover, for the sake of simplification, the unlimited market liquidity was adopted and all open positions are buy transactions.

The starting balance for a single strategy is EUR 50,000. Assuming that the margin is fixed and constitutes 5% of the nominal value, in the case of the average rate of 10,000 points and a multiplier of 25 euros, its value fluctuates around 12,500 euros. Given that the stop-out mechanism, i.e. automatic closing of the position by the broker, occurs when the valuation of the account drops to 50% of the required margin, the investor may „lose" 1,750 points.

2.2. Trading systems results

The first strategy tested was a system based on two moving averages and the ADX index (SMA20; SMA5; ADX14). Long positions were opened when three conditions were simultaneously met: the faster moving average crossed the slower average from the bottom, the +DI line was above –DI and the ADX indicator was higher than 25, indicating a relatively strong uptrend. The exit from the market took place as the faster average fell below the slower one, suggesting an impending technical correction.

In the period from January 1, 2015 to March 30, 2020, the system generated 26 buy signals. Profitable trades accounted for 50% of the total for a gross profit of €129,124 with a gross loss of €81,963. As a result, the total net profit (excluding taxation) was 47,161 euros. The largest profitable trade allowed the investor to earn EUR 30,827, while the average profitable trade was EUR 9,932. Likewise, the most losing position depleted an investor's portfolio by €11,813, with an average loss transaction of €6,304. The profit ratio is calculated as the ratio of gross profit to gross loss 1.58, while the expected profit on one transaction is approximately EUR 1,814.

The capital curve during the entire investment period is presented below.

Figure 1. Capital curve for the SMA – ADX strategy

Source: own elaboration.

It is worth noting that the account balance not even once fell below the initial deposit of EUR 50,000, so all loss positions only reduced profits and not invested capital. The final account balance is 97 161 euros.

The next investment strategy was based on MACD and Parabolic SAR (EMA12; EMA26; MACD SMA26; AF = 0.01; max 0.2). The buy signal was generated when the price was above Parabolic with simultaneous MACD readings above the 0 line. Positions were closed when the index was below the Parabolic dot. In order to generate fewer false signals, the acceleration parameter was set at 0.01.

For nearly 5 years, the strategy gave 35 buy signals. Profitable transactions accounted for less than 43% of all items, bringing a gross profit of EUR 152 586 with a gross loss of EUR 143 768. The total net profit was 8,818 euros. The most successful transaction was EUR 21,536, while the average profitable transaction was EUR 10,172. On the other hand, the most losing position depleted the account balance by EUR 13,284 with an average loss transaction of EUR 7,188. The profit ratio showed a value of 1.06, while the expected profit on one transaction is around EUR 252.

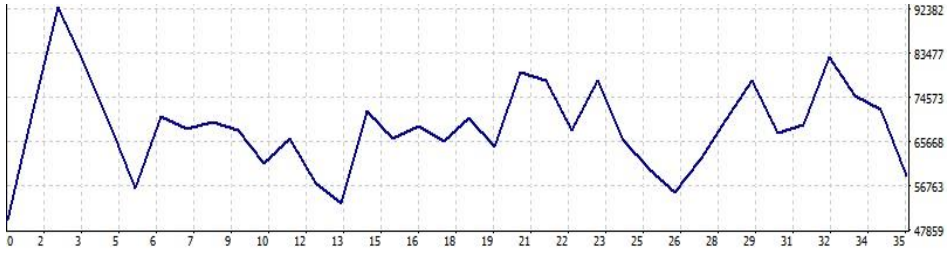

Figure 2. Capital curve for MACD – PSAR strategy

Source: own elaboration.

As in the case of the first trading system, the investor did not have to face a reduction in invested capital, as the balance of the operating register never fell below the threshold of EUR 50,000 although as a result of two losing positions in the second half of 2016, the balance fell to a record low level 53 290 euros. The account balance as of March 30 this year is EUR 58 818.

The third trading system used information from the RSI oscillator and Bollinger Bands (sigma = 2; SMA20; interval = 5; oversold-buy-in: 30–70). The buy signal was generated when the oscillator was returning from the oversold zone (from levels below 30 points) and the rate was „rebounding" from the lower Bollinger band. The position was closed when the quotes returned from the middle or top band. The rejection was considered to be at least two downturn candles on the daily interval. In the event that the rate did not even approach the simple moving average, a defensive stop loss order was placed, located slightly below the last local lows.

The system provided 44 buy signals throughout the research period. The number of profitable transactions as well as the loss ones was 22. The gross profit was 207,638 euro with the gross loss of 134,394 euro. The total net profit was therefore EUR 73 243. The single transaction on which the investor could earn the most was opened on January 29, 2015 and allowed to realize a profit of EUR 28,651, while the average profitable transaction is EUR 9,438. The most losing position reduced profits by EUR 12,003 with an average loss transaction of EUR 6,109. The profit ratio showed a value of 1.54, while the expected profit per transaction is approximately EUR 1,665.

As when testing the two previous systems, the investor did not have to worry about reducing their initial balance.

Figure 3. Capital curve for the Bollinger Bands strategy – RSI

Source: own elaboration.

Looking at the capital curve, it can be concluded that the strategy, except for two weaker periods, allows you to generate systematic profits. Moreover, it allowed to stay out of the market during this year's stock market crash. Ultimately, the account balance on March 30, 2020 oscillated around EUR 123,240.

The Japanese system based on the discovery of Goichi Hosoda (*tenkan* = 9; *kijun* = 26; *senkou* = 52; *chikou* = 26) gave the green light to open a long position when several conditions were simultaneously met. *Tenkan-sen* had to be above *kijun-sen*, index rate above cloud and *chikou-span* line above price. The position was closed if the *tenkan* line broke through the *kijun* line from the top or the quotes went below the *kumo*.

The ***Ichimoku Kinko Hyo*** technique has only been used 22 times over a five-year period, 12 of which are profitable (54.55%). The first of them turned out to be the most profitable (EUR 39,844), but the maximum balance later exceeded EUR 90,000. The gross profit was EUR 124,216 and the gross loss was EUR 113,697, resulting in a net profit of EUR 10,519. The most losing position reduced the value of the portfolio by EUR 17 823 with an average loss transaction of EUR 11 370. A fairly low reading showed a profit ratio of 1.09 as well as a projected profit of EUR 478.

The capital curve is as follows.

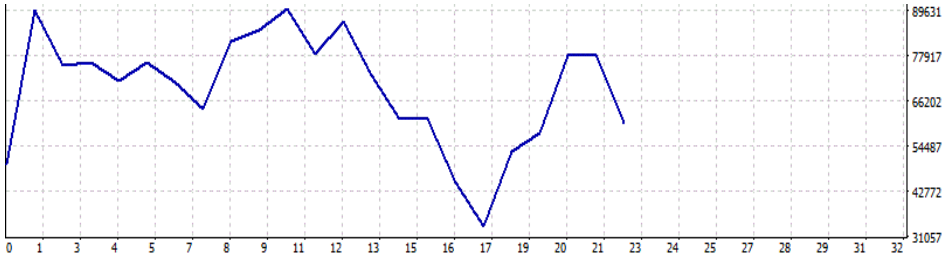

Figure 4. Capital curve for Ichimoku strategy

Source: own elaboration.

Although the system allowed to generate profit during the investment period, some attention should be paid to its failure during the first three quarters of 2018, leading to a decrease in capital towards EUR 33,875. The final value of the portfolio at the end of the research period was EUR 60,520.

The fifth strategy was based on the Donchian channel and the CCI oscillator (Donchian n = 20; CCI n = 20; typical price = HLC/3). The system assumed connecting to the existing trend, therefore, in order for a long position to be opened, the CCI oscillator should go above 100, and the rate should break the upper band of the channel. Positions were closed relatively quickly when the CCI started to return below the level of 100, so it was unnecessary to set a defensive stop loss order.

Since the beginning of 2015, the system has generated as many as 45 buy signals. Profitable trades only accounted for 37.80% of all items, but the gross

profit of EUR 118,375 exceeded the gross loss (EUR 85,005). As a result, the total net profit was EUR 33,369. The largest profitable transaction allowed the investor to earn EUR 23,602, while the average profitable transaction oscillated around EUR 6,963. The most unsuccessful investment depleted the investor's portfolio by EUR 9,350 with an average loss transaction of EUR 3,036. The profit ratio was 1.39, while the expected profit on one transaction is around EUR 742.

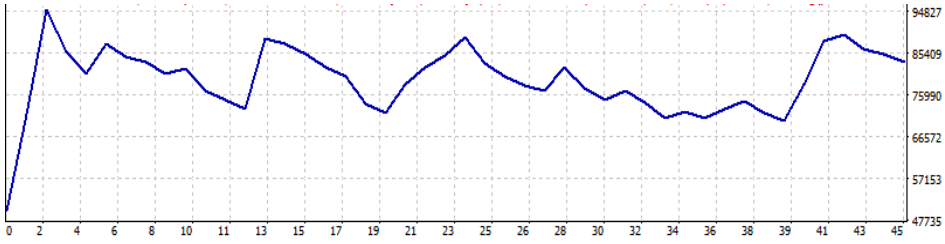

Figure 5. Capital curve for the Donchian Channel – CCI strategy

Source: own elaboration.

When analyzing the capital curve, it should be emphasized that the investment could provide the investor with mental comfort. Not only did the system not contribute to a reduction in the initial balance, but not even once the account balance fell below EUR 70,000. The final balance of the account is EUR 83,369.

The last trading system using a stochastic oscillator and a Keltner Channel (%K = 5; %D = 3; EMA20; ATR period = 10; ATR multiplier = 2) is a typical contrarian strategy. The investor should open long positions when the rate rebounded from the bottom band of the channel and the faster %K line breaks the slower %D in the oversold zone, i.e. below 30 points. In the strategy, as in most previous cases, no defense orders were used because the exit from the market took place when the %K line crossed the %D line from the top.

Finally, 39 transactions were made under the strategy, 22 of which turned out to be profitable (56.40%). Gross profit of EUR 189,929 significantly exceeded the gross loss of EUR 114,032, giving a net profit of EUR 75,897. The most profitable transaction earned EUR 24,905 with an average of EUR 8,633. The most losing position was a loss of EUR 31,480, which resulted from the more than 500-point price gap on March 9, 2020. The average losing trade was around EUR 6,708, while the profit ratio was 1.67 and the expected profit per item is EUR 1,946. A slightly different version of the report also allows for a different presentation of the results and provides additional data.

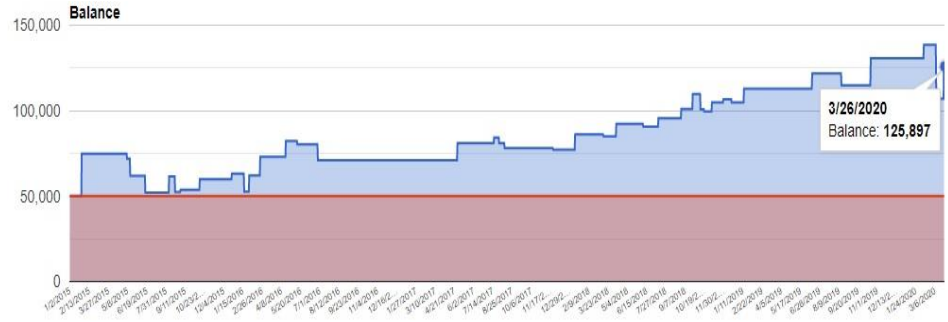

Figure 6. Capital curve for the Keltner Channel – Stochastic strategy

Source: own elaboration.

As we can see, the last strategy at the end of the investment period allowed the investor to enjoy the highest profit with a relatively high percentage of profitable trades. Below is a summary of the strategy's results in absolute terms.

Table 1. Summary of the results of individual strategies

Strategy	Lowest balance	Highest balance	Final score
1	50 000	97 161	97 161
2	50 000	92 830	58 818
3	50 000	130 743	123 243
4	33 875	90 220	60 519
5	50 000	95 301	83 369
6	50 000	138 580	125 897

Source: own elaboration.

The least profitable system turned out to be the PSAR – MACD strategy although the Ichimoku technique generated a slightly better result, which additionally, in the analyzed period, was the only one that „went down" below the level of initial capital.

2.3. Comparison of strategies based on the Sharpe index and MAR

Looking only at the achieved rate of return, the best strategy turned out to be the last one, based on the stochastic oscillator and the Keltner Channel. However, when measuring the effectiveness of the strategy, the risk incurred should be taken into account. The resulting measure of effectiveness is called the risk-adjusted rate

of return. This concept includes, among others, Sharpe meter. The higher the ratio, the better, as the strategy generated a higher rate of return per risk unit. The Sharpe measure is defined by the following formula [Ormaniec 2019: 32]:

$$Sh = \frac{r - rf}{\sigma},$$

where:
r – the average rate of return on the portfolio,
rf – risk-free rate of return,
σ – standard deviation of rates of return.

The value of the indicator itself after adjusting for the incurred risk is not enough to assess the quality of individual strategies, but only serves to compare them [Jajuga 2015: 257]. The indicator is the most frequently used measure of the management efficiency of investment funds, but it can also be successfully used to evaluate transaction systems.

In the study, the average rate of return on the portfolio was taken as the average of the annual rates of return over the full 5 years (thus the first quarter of 2020 was omitted). The most frequently considered risk-free rate is the yield on 10-year treasury bonds. In the analyzed period, the average profitability of German „10-year-olds" fluctuated around 0%, therefore, the Sharpe index was adjusted to the quotient of the average annual rates of return and their standard deviation. The results are presented in the table below.

Table 2. Sharpe index for the analyzed transaction systems

Strategy	Average annual rate of return [%]	Standard deviation [%]	Sharpe Ratio
1	17,3	30,2	0,57
2	11,1	26,1	0,43
3	25,2	41,1	0,61
4	28,2	72,4	0,39
5	14,5	31,0	0,47
6	21,6	10,9	1,98

Source: own elaboration.

The most effective strategy turned out to be the one based on the Keltner Channel and the stochastic oscillator, and the least effective strategy was number 4, i.e. the Japanese *Ichimoku* technique.

Another indicator that can be used to compare transaction systems is MAR (Managed Account Ratio). We calculate it as the quotient of two values [www4, access 24.04.2020]:

$$MAR = CAGR\ \% \ / \ maxDD\ \%$$

CAGR is nothing more than the rate of capital growth calculated in relation to the initial value and smoothed to annual periods. The denominator of the equation is the maximum percentage of capital drawdown, understood as the distance between the local maximum and minimum on the capital curve during the entire investment period [www9, access 24.04.2020]. During the 21 analyzed quarters, the highest MAR was characteristic for strategy no. 3, i.e. based on the Bollinger bands and the RSI oscillator. Strategies 5 and 6 also showed a high reading, while strategy 2 (Parabolic SAR along with MACD) was the worst. The table below presents a list of individual systems.

Table 3. MAR coefficient for the analyzed transaction systems

Strategy	CAGR [%]	maxDD [%]	MAR
1	13,5	16,4	0,82
2	3,1	18,8	0,17
3	18,7	15,3	1,23
4	3,7	26,7	0,14
5	10,2	9,8	1,04
6	19,2	22,7	0,85

Source: own elaboration.

Based on the data contained in the above tables, it can be concluded that the best strategies turned out to be strategies no. 3 and 6, while the least effective are strategies no. 2 and 4.

Interestingly, the Sharpe and MAR ratios provided information in line with the final balances on the investor's account.

3. PASSIVE STRATEGY – „BUY AND HOLD"

An alternative to active investment strategies that use technical analysis is a passive long-term investment strategy based mainly on fundamental analysis. Unfortunately, in the case of stock indices, comparing them is not as easy as it may seem. Well, long-term maintenance of positions on futures or CFDs would

be associated with very large capital slips. Moreover, the costs of holding positions on contracts for difference would significantly reduce the investor's possible profits. Therefore, when it comes to passive strategies, a better solution is, for example, investments in ETFs, on which active trading is not profitable because both when buying and selling, commissions of about 0.30% are charged [www10, access 27.04.2020].

Despite the slightly different specificity of the instruments corresponding to a given strategy, it is worth looking at how a buy and hold investment would look like in the same investment horizon against the background of previously tested trading systems. The analysis was carried out on the largest, in terms of assets, ETF replicating the DAX index, i.e. iShares Core DAX UCITS ETF, in which all dividends are reinvested [www11, access 27.04.2020].

Assuming that the investor purchased the participation units at the beginning of 2015, they had to pay 95 euros for each. During the course of the investment, their value dropped four times below the purchase price, reaching the lowest level of EUR 82 (–13.7% of the capital invested) in the March panic in 2020. The highest return could have been achieved in January 2018 and February 2020, when the rate was close to EUR 131 (+37.9%). If the investor decided to sell the units at the end of March 2020, they would receive EUR 95 for each of them, which is the same price as at the start of the investment, after nearly 16% rebound from this year's minima. In this case, the MAR coefficient would oscillate around 0.

Let us consider one more scenario that ignores the first quarter crash of this year. The unit price (including dividends paid and reinvested) at the end of 2019 was EUR 126.70. With a CAGR of 5.9% and a maximum 2015–2016 capital draw of 25.8%, the MAR index would show a reading of 0.23. Sharpe's measure, calculated in the same way as for the 6 tested strategies for a period of full five years, shows the value of 0.43.

Table 4. Summary of the results of all tested strategies

Strategy	Lowest return [%]	Highest return [%]	Final score [%]	MAR	Sharpe Ratio
1	0,0	94,3	94,3	0,82	0,57
2	0,0	85,7	17,6	0,17	0,43
3	0,0	161,5	146,5	1,23	0,61
4	–32,3	80,4	21,0	0,14	0,39
5	0,0	90,6	66,7	1,04	0,47
6	0,0	177,2	151,8	0,85	1,98
ETF	–13,7	37,9	0; (33,4)	0; (0,23)	0,43

Source: own elaboration.

Data with a summary of the active and passive strategies are presented in Table 4.

For ETF investments, figures in parentheses assume unit sales on December 31, 2019.

3.1. Research summary

The data presented in Table 3 show that during the research period, only two strategies (*Ichimoku* and ETF) would produce negative returns at the worst possible end of the investment. At the best moment, the „passive" investment achieved the lowest result. Looking at the final balance at the end of 2019, as many as 4 systems based on technical analysis were more effective than the „buy and hold" strategy, and at the end of the first quarter of 2020 – all of them. When analyzing the measures of management quality, it turns out that taking into account the 21 quarters, the passive strategy was characterized by the lowest MAR index. The Sharpe's measure is also relatively weak compared to the 4 leading strategies.

In addition, each of the systems achieved a positive rate of return, and losses were only reduced by the previously generated surpluses in as many as 5 out of 6 examined cases. The average profit for a single strategy is EUR 41,500 or 1,660 points.

SUMMARY

The aim of the article was to test the effectiveness of trading systems built on the basis of technical analysis in 2015–2020 on the DAX stock exchange index. This goal has been achieved, which is confirmed by the results of the research that allow to evaluate the effectiveness of the transaction systems under study in 2015–2020. On the basis of the transactions carried out, it can be concluded that the technical analysis works in practice and on its basis it is justified to construct investment strategies that can bring profits in the long term while maintaining an appropriate level of risk. It is true that the percentage of unprofitable positions was relatively high, but the generated sell signals made it possible to cut losses quite quickly. As a result, only one of all analyzed capital curves fell below the level of initial capital during the investment period. It is worth noting that additional verification of more parameters for each oscillator, channel or moving average, as well as changing the time interval or other tool combinations, would probably improve the performance of the systems. A comparison against the background of passive investment, both in terms of the quality of portfolio management and the achieved rates of return, is definitely in favor of active strategies. However, due

to the different specifics of the instruments, it should be approached with a lot of caution.

In the light of the conducted research, it is worth emphasizing that there is no single best transaction system that will always bring above-average rates of return, regardless of the current market situation. Financial markets are characterized by high dynamics of changes, therefore, a strategy that has been successful in recent years may not necessarily prove successful in the future. Moreover, the obtained results indicate that the evaluation of the effectiveness of a given strategy differs depending on the measures used.

Technical analysis is not without its drawbacks. Perhaps it does not discount all information, but only the well-known or foreseeable by the market. The simulations carried out prove that technical analysis is an effective tool for risk management and, in combination with fundamental analysis, increases the probability of success. It is clear that history does not always have to repeat itself, but the psyche of investors has remained unchanged for years.

LIST OF ABBREVIATIONS

ADX – Average Directional Movement Index
ATR – Average True Range
CCI – Commodity Channel Index
CFDs – Contracts For Difference
DAX – Deutscher Aktienindex
DI+ – (Directional Indicator +)
DI– – (Directional Indicator –)
DMI – Directional Movement Index
ETF – Exchange traded fund
MACD – Moving Average Convergence/Divergence
MAR – Managed Account Ratio
PSAR – Parabolic Stop and Reversal
SAR – Parabolic Stop and Reversal
SMA – Simple Moving Average
RSI – Relative Strength Index

BIBLIOGRAPHY

Bąk B., 2015, *Skuteczność techniki Ichimoku na przykładzie kontraktów terminowych na indeks WIG20*, Uniwersytet Marii Curie-Skłodowskiej, Wydział Ekonomiczny, Lublin.

Borowski K., 2001, *Technika Ichimoku (renesans japońskiej techniki inwestowania)*, „Studia i Prace Kolegium Zarządzania i Finansów", z. 19.

Borowski K., 2017, *Analiza techniczna. Średnie ruchome wskaźniki i oscylatory*, Difin, Warsaw.

Borowski K., 2018, *Metody inwestowania na rynkach finansowych*, Difin, Warsaw.

Borowski K., 2019, *Efficiency and stability of trading systems based on plain, exponentially and linearly weighted moving averages*, „Annales Universitatis Mariae Curie-Skłodowska. Section H–Oeconomia", vol. 53, no. 4.
Czekała M., 1997, *Analiza fundamentalna i techniczna*, Wydawnictwo Akademii Ekonomicznej im. Oskara Langego, Wrocław.
Elder A., 2018, *Zawód Inwestor Giełdowy. Nowe ujęcie*, XTB, Poznań.
Elliott N., 2007, *Ichimoku Charts. An introduction to Ichimoku Kinko Clouds*, Harriman House.
Etzkorn M., 1999, *Oscylatory*, WIG Press, Warsaw.
Frierdich M., 2013, *Hedge Funds. Die Konigsklasse der Investments*, FBV, Monachium.
Jabłoński B., 2006, *Innowacyjna strategia ograniczająca ryzyko walutowe*, Uniwersytet Ekonomiczny w Katowicach, Katowice.
Jajuga K., 2015, *Inwestycje*, Wydawnictwo Naukowe PWN, Warsaw.
Kochan K., 2009, *Forex w praktyce*, Helion, Gliwice.
LeBeau C., Lucas D., 1998, *Komputerowa analiza rynków terminowych*, WIG PRESS, Warsaw.
Murphy J., 1995, *Analiza techniczna*, WIG PRESS, Warsaw.
Murphy J., 2017, *Analiza techniczna rynków finansowych*, Admiral Markets, Poznań.
Nowakowski J., 2003, *Normalizacja wskaźników analizy technicznej*, „Studia i Prace Kolegium Zarządzania i Finansów", z. 29.
Ormaniec T., 2019, *Możliwość osiągania ponadprzeciętnych stóp zwrotu na podstawie informacji o sprzedaży oraz umorzeniach jednostek uczestnictwa w otwartych funduszach inwestycyjnych*, „Studia i Prace Kolegium Zarządzania i Finansów. Zeszyt Naukowy", nr 173.
Oziemczuk K., 2011, *Ichimoku. Japońska strategia inwestycyjna*, Bullet Books, Warsaw.
Pająk A., 2013, *Dochodowość inwestycji w kontrakty terminowe na akcje w Polsce*, Wydawnictwo Adam Marszałek, Toruń.
Rockefeller B., 2012, *Analiza techniczna dla bystrzaków*, Wydawnictwo Septem.
Słupek T., 2001, *Analiza techniczna. Wprowadzenie*, Dom Wydawniczy ABC, Cracow.

Other Internet Sources

Cennik Biura Maklerskiego ING Banku Śląskiego, www.ing.pl/indywidualni/inwestycje-i-oszczednosci/inwestycje-gieldowe/etf [access 27.04.2020].
[www1] www.3sigma.com/whats-so-special-about-3-sigma [access 03.03.2020].
[www2] www.admiralmarkets.pl/education/articles/forex-indicators/parabolic-sar-forex [access 28.02.2020].
[www3] www.admiralmarkets.pl/education/articles/forex-indicators/wskaznik-cci [access 24.04.2020]
[www4] www.blogi.bossa.pl/2008/05/30/miary-oplacalnosci-i-ryzyka-transakcji/ [access 24.04.2020].
[www5] www.blogi.bossa.pl/2011/04/22/subiektywizm-analizy-technicznej/ [access 02.02.2020].
[www6] www.comparic.pl/category/analizy/indeksy/dax/ [access 10.04.2020].
[www7] www.comparic.pl/parabolic-sar-przewodnik-od-tradeciety/ [access 30.03.2020].
[www8] www.comparic.pl/tradeciety-wstega-bollingera-najlepszy-wskaznik-wielu-powodow/ [access 2.04.2020].
[www9] www.fxmag.pl/artykul/obsuniecie-kapitalu-jak-interpretowac-drawdown [access 24.04.2020].
[www10] www.ing.pl/individual/investment-and-savings/investment-gieldowe/etf [access 27.04.2020].
[www11] www.justetf.com/en/how-to/dax-etfs.html [access 27.04.2020].
[www12] www.parkiet.com/artykul/1432239.html [access 27.03.2020].

[www13] www.parkiet.com/artykul/1433930.html [access 15.04.2020].
[www14] www.sii.org.pl/static/img/004366/Podstawy_analizy_Ichimoku.pdf [access 15.03.2020].
[www15] www.thebalance.com/how-to-day-with-trade-keltner-channels-4051613 [access 20.03.2020].
[www16] www.tms.pl/wskazniki-trendu [access 27.02.2020].
[www17] www.tradersarea.pl/kanal-donchiana/[access 28.03.2020].

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HEALTH CAPITAL AND ITS RELATIONSHIP TO ECONOMIC GROWTH

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Abstract

The purpose of the article/hypothesis: The purpose of this paper is to attempt to justify the thesis that the health potential of human and society has an impact on economic well-being, contributing to the economic growth of countries, and thus their enrichment.
Methodology: In order to examine the significance and strength of the impact of health capital on productivity on a macroeconomic scale, an econometric model of economic growth was used and six estimations were made in which the impact of subsequent components of this capital was examined.
Results of the research: It turned out that 4 out of 6 introduced variables of health capital significantly influenced economic growth, and their direction is consistent with the economic theory. This implies necessity for further studies.

Keywords: economic growth, health indicators, health capital.

JEL Class: C21, I15, O47.

INTRODUCTION

Health from the earliest times has been a matter of concern for man and society, and its lack is widely recognized as one of the main causes of life shortages and the inability to fully realize human potential. Still unexplored possibilities of man and his ability to influence and transform the environment in which he lives are the subject of many studies in which the value and significance of health potential is increasing more and more. The high level of this potential can co-decide on the development of individuals and societies on many levels, which is not without significance for economic and financial well-being on a micro- and macro-economic scale. The growing awareness of the measurable benefits of investing in health capital, encourages economists and analysts to attempt to value human health and life. Such a trend has been observed for years, among others in the insurance industry or in the sector of health care services. Health „valuation" often involves estimating the value of income that a person could get if he could work in full health, as well as focusing on estimating the costs incurred as a result of chronic diseases or civilization diseases. In both of these cases we can say about the increasing or decreasing ability to increase the well-being of individuals and economies, which can be reflected in the financial situation of households – on the one hand, as well as in the size of national income or GDP – on the other.

The purpose of this paper is to attempt to justify the thesis that the health potential of human and society has an impact on economic well-being, contributing to the economic growth of countries, and thus their enrichment. To this end, the importance of health considered in the context of economic capital was presented, indicating its most important areas and determining the determinants on which the size of the health potential of individuals and societies depends. After the theoretical part, the conclusions of the econometric study, in which individual components of health capital were introduced to the basic model of economic growth to examine the significance and strength of the impact of health capital on the rate of economic growth were presented.

According to the authors, a comprehensive approach to health analysis through the prism of its most important determinants should replace the current attempts to include in the models of economic growth only the indicator of average life expectancy or the mortality rate and theirs modifications. These indicators may not provide full information on the potential impact of health on economic growth. The contribution of this article to the literature is an indication that in econometric studies of the impact of health capital on economic growth a different approach is also possible.

1. HEALTH AS AN ECONOMIC CAPITAL

The health of individuals and society, and the role of the state in its maintenance in terms of potential economic benefits is the subject of economic interest. In this sense, health may be perceived as a special kind of resource or capital conditioning the productivity of both individual enterprises and entire economies, which contributes to their growth at the national and global level [Marchewka 2000: 106–107].

The concept of „capital" seems to be extremely important in this perspective, which can be defined in many ways as a separate issue. In the classic approach proposed by Adam Smith, capital (in this approach – only physical capital), next to work and land, is one of the basic factors of production [Marchewka 2000: 106–107]. A more general definition is provided by the Encyclopedia of Management, according to which capital is a type of resource for multiplying economic benefits in three different forms: cash resources, means of production and intangible resources [www1, access 20.05.2019].

In recent years, particular attention has been paid to the role of non-material production factors, which in the literature of the subject are referred to as human and social capital. The concept of the so-called „Living capital", which is defined as „capital contained and embodied in people, unlike land, buildings, machinery and other tangible assets" [Roszkowska 2013: 12]. It can therefore be said that the most valuable resources in enterprises and the economy also include human knowledge, skills and competences along with their health and the natural need to create and nurture social bonds. An example of such an approach can be the definition of the American economist Theodore Shultz, who defined human capital as: „the resource of knowledge, skills, health and vital energy contained in society. This resource is not given by the genetic characteristics of the population once and for all, but it can be increased through investments called investments in people: in people, in human capital, in human life" [Roszkowska 2013: 13].

Health, in addition to education and the ability to live in organized society, is therefore treated as a special resource that enables individuals a meaningful, creative and satisfying life and influencing their own biological heritage. The possibility of „investment" or increasing the health potential by the individual and indirectly by governments is emphasized in some views of the health resource as „biological capital" or „physiological capita" [Domaradzki 2013: 410].

Biological capital is defined as a set of relatively persistent psychophysical features important from the point of view of the effective adaptation of individuals to applicable system rules, which may appear as factors facilitating or even enabling success in specific areas of social life. Its main components include: strict health (no illness), physical and mental fitness, youth and beauty. The possibility

of influencing the biological heritage understood in this way links more closely what is called health capital with the consumption of health goods such as: fitness services, plastic surgery, healthy food, instructors and dietitians' advice in the field of cosmetology or health promotion [Domaradzki 2013: 417]. Thus, it can be said that health in economic terms can also be a „commodity" that is purchased by consumers expressing demand for health services. This is conducive to the commercialization of the healthcare sector, which is confirmed by the trend of increasing spending on health by governments.

The author of the concept of physiological capital is the Nobel laureate, American economist Robert Fogel, who explained the increase in health and economic potential as a consequence of the progressing physiotechnological evolution [Fogel 2012: 112–113]. According to Fogel, in the last three centuries, man has managed to significantly take control of the surrounding environment. This impact, combined with technological progress, makes the environment undergo constant transformations, which are characterized by high dynamics, and consequently also lead to adaptive changes of the human body. According to the author of this concept, the average body size increased by about 50% and life expectancy by over 100%, which led to a great improvement in the strength and abilities of the human body. According to the economist, the concept of physiological capital is a logical consequence of the theory of physiotechnological evolution and is associated with human life opportunities that change from generation to generation. The accumulation of this capital means an increase in the vital forces of the human body as a result of overcoming the problem of chronic malnutrition and overall improvement in living conditions, and is expressed in an increase in body weight, reduced susceptibility to disease, prolonged life, and increased physical and intellectual fitness. According to Fogel, this resource can be accumulated by influencing its two basic components: thermodynamic and physiological, which translates into economic growth and in this sense can be considered as an important element of government policy.

Health capital, being an economic category, creates the basis for examining and maintaining health in the category of financial expenditure incurred on a macro scale – by the state and micro – by numerous economic entities, mainly households. The cost of obtaining and maintaining health is estimated by many institutions related to the health sector, which include pharmaceutical, insurance, transport and environmental protection agencies, which, for example, value the costs of environmental degradation taking into account the increase in morbidity and premature deaths due to this reason.

Being valued, health as capital is also subject to the laws of supply and demand [Morris 2012: 20]. Demand for health is often perceived in an effective approach and is expressed as the actual desire and opportunity to purchase a specific good or medical service. On the other hand, the supply of health is

understood as expenditure incurred for organizing production factors (staff, buildings, raw materials) in order to offer goods and services, i.e. health services that are in demand [Korporowicz 2011: 75]. As can be seen, health as capital may be subject to various economic analyzes, however, being a non-material and inherent resource in every human being, it cannot be the subject of trade, and thus cannot be analyzed using market mechanisms. In this context, the theory of health production is very important from the point of view of determining the demand and supply for this resource. Grossman pointed out the possibility of producing the good called health [Morris 2012: 25] claiming that health is a resource that produces „healthy time" in which human being achieves optimal productivity. The capital in this approach is the initial stock of health which is depreciated and in which one should invest, and the production function itself depends on the unit's efficiency defined as the amount of health obtained from a given amount of expenditure on this resource. Production of health in terms of supply means the relationship between factors used in the production process (buildings, staff, equipment) and the result of this process (the number of services in the field of health protection and their quality). This approach allows you to measure factors and products in many ways and observe the various relationships between them. This is useful in determining the effectiveness of certain moves, such as: Is it more profitable to run a large or small hospital?; How much will the number of services provided in the facility increase assuming that an additional nurse will be employed? e.t.c. [Morris 2012: 23].

Thus, it can be said that health, being a non-material type of capital, is becoming increasingly important for economies, and awareness of its impact on the well-being of individuals and societies is the basis for emphasizing its distinctiveness in economic analyzes. For this reason, health capital is defined mainly as the potential for life and health, which depreciates with age and depletes upon death, in which investments can be made through health-promoting policies of governments and conscious choices. Poor health determined by chronic illness or mental health problems reduces the individual's productivity, potentially also reducing professional activity and the period of employment, which negatively affects the productivity of enterprises and economies on a macro scale. Important features of health capital include: it can be produced and can be increased through investment, has an impact on human well-being and productivity of the economy, can be considered in terms of demand and supply, is a rare good in relation to human expectations.

2. HEALTH CAPITAL DETERMINANTS

The most commonly used indicators representing the health of the population include life expectancy, which among the many alternatives used is an indicator of variance least susceptible to changes in the set of explanatory variables considered significant in growth models. Researchers using average life expectancy in growth models include Barro and Sala-i-Martin [2004], Easterly and Levine [1997], Sachs and Warner [1997], Bhargava et al. [2001] and Bloom [2004]. The positive impact of this indicator on economic growth is noted by Arora [2001], who claims that over the past century, health improvement has not only been a side effect of growth, but has also been conducive to it by increasing long-term growth by around 30–40% in industrialized countries. Cooray [2013] comes to different conclusions, which focuses on showing the diverse impact of health capital on economic growth in countries with different income levels. According to this author, each subsequent year of life of men causes an increase in the rate of economic growth by 0.05%. In addition to the expected life expectancy of women and men, the set of variables reflecting population health included natural increase, government spending on health and adult survival rate.

A popular and quite often used indicator in studies of the impact of health on economic growth is the Adult Survival Rate. Bhargava et al. [2001] introduce an adult survival rate and fertility rate into the growth model, and the data is estimated on a sample of 73 countries over a 25-year period. The estimation results are compared for data obtained from the Penn World Table (PWT) and World Database Indicators (WDI) in two approaches: the first assumes the exogenity of delayed GDP and the growth rate, in the second approach they are treated as endogenous variables. The models show a significant impact of the „Adult Survival Rate" (ASR) indicators for low-income countries. In the poorest countries, a 1% change in ASR is associated with an increase of around 0.05% in the rate of economic growth. Similarly, an increase in the ratio of investment outlays to GDP by 1% is associated with an increase in the growth rate of only 0.014%.

The first attempts to construct synthetic measures relating to health can be seen in the works of Torrance [1976] and Holland [1985]. In his work, Torrence presented a synthetic development of fourteen health indexes based on the analyzed empirical studies of other authors in order to unify the concept, terminology and mathematical notification in the methodology of creating next indicators. In Holland's monoraph, however, practical methodological guidelines for the construction of indexes relating to economic methods of analyzing the benefits and values lost by patients can be found. To this end, the author identifies three methods for quantifying health change: the use of a subjective

health scale in many aspects; willingness to consume or receive health care and to use the measure of the number of years of life corrected by its quality (QUALY).

From the point of view of health capital, it is extremely important to try to identify and explain the factors determining its formation. In the context of contemporary thinking about health, the basis for further reflection in this regard is the concept created by the Minister of Health of Canada – Marc Lalond in 1974, called the „fields of health" model [Sygit 2017: 28]. This model shows health determinants in a broader connection with the social context and divides them into four areas: lifestyle, environment, medical care and human biology.

According to the results published in the minister's report, medical services and health care determine the health potential of an individual to the least, as the impact fluctuates around 10%. More important, because 15% impact is characterized by human biology, i.e. genetic factors on which a person has no real influence. The environmental impact of health has been estimated at 25%. In this group of factors there are elements such as: employment conditions, housing conditions, income or cultural norms. The most important element determining health in 50% turned out to be lifestyle, which included all human decisions, usually as repetitive habits and habits acquired in the course of life, stimulating health (e.g. regular physical exercises) or leading to its gradual degradation (e.g. smoking, inadequate diet, alcohol abuse). In view of the above results, the emphasis was primarily on the decisive role of the individual's responsibility for their own health.

The „health fields" model is useful from the perspective of the individual's health, but it is not sufficient from the point of view of the population's health, which is why it was decided to extend it. Such an attempt was made, among others in the „Investment for Canadians' health" strategy [Woynarowska 2013: 45], which lists the following factors on which public health depends:

– earnings and social status – considered to be the most important single factor affecting health, the higher the income and status, the better the health;

– social support networks – support from family and friends reduces the risk of many diseases and destructive behavior in the local community;

– education – its higher level increases the ability of people to manage their lives and control their health, and improves their chances of getting a job;

– employment and working conditions – unemployment increases the risk of health problems, especially depression and anxiety, and gradual social isolation;

– physical environment, which can be divided into: natural (the state of air, water, soil) and created by man (safety in the place of residence, workplace, in traffic);

– biology and genetic equipment – the individual's genetic potential, functions of individual body systems and their age;

– health behaviors and ability to deal with stress – directly affect human health, but are dependent on social factors, as well as knowledge and skills to make the right choices;

– proper development in childhood – starting from the fetal period and in early childhood, is of fundamental importance for health and well-being in later life;

– health care – in an organized and directed form to protect and improve health and disease prevention;

– gender – other causes of loss of health due to gender are observed, e.g. men are mainly cardiovascular diseases, fatal accidents and cancer, while women are more at risk of developing depression or chronic diseases such as allergies;

– culture – all dominant cultural values constituting a risk factor for certain social groups (stigmatization or marginalization).

Similarly, the factors conditioning human health are viewed by WHO, which on the Health Knowledge Portal in addition to defining its essence, also gives determinants, which include: income and social status; education; physical environment; social support networks; genetics, healthcare and gender. It is worth noting that in this perspective, the lifestyle and ability to cope with stress have been classified as factors related to human genetic conditions, and the wider context of the impact of culture, social habits and traditions has been placed in the category of building social bonds.

Referring to the above analyzes, it can be said that today, the quality of health capital is largely determined by socio-economic factors and lifestyle. The latter emphasizes the importance of conscious human choices in accordance with „your health in your hands", which should be focused on health-promoting activities. Among these behaviors, four basic groups can be distinguished:

– behaviors related mainly to physical health – care for the body and the immediate surroundings, physical activity, rational nutrition, hardening and sleep;

– behaviors related mainly to psychosocial health, i.e. using and giving social support as well as dealing with problems and stress;

– preventive behavior, i.e. self-examination of health, undergoing preventive examinations, safe behavior in everyday life (in traffic, work, etc.), which also includes sex life;

– elimination of risky behaviors, which include: smoking, alcohol consumption, abuse of prescribed drugs and the use of other psychoactive substances [Woynarowska 2013: 52].

3. HEALTH CAPITAL AND ECONOMIC GROWTH – ECONOMETRIC MODEL AND ESTIMATION RESULTS

Hypotheses about the potential impact of health on economic growth should be confirmed in empirical econometric studies. The parameters were estimated in the GRETL econometric package using the Classic Least Squares Method (KMNK). In order to verify the hypothesis about the significant impact of various components of health capital on economic growth, it was necessary to estimate the parameter for each component regardless of the other additional tested factors. Such action eliminated the potential impact of disturbances caused by subsequent indicators, which could lead to collinearity.

The data used for the model comes from the World Bank and the World Health Organization databases and include 6 variables related to specific dimensions of health capital for 208 countries. Most of the indicators were collected for the years 2000–2017, which was the adopted time horizon, but it was not possible for everyone to obtain average values based on a minimum of 18 observations, therefore, in each estimation we use as many observations as possible. Individual variables were introduced sequentially to the typical economic growth model (initial model), which – according to the assumptions of the theory of economic growth – took into account three main determinants:

– GDP per capita measuring the strength of economic convergence;
– Investment rate measuring the investment level;
– A variable related to human capital (usually illustrating the level of education).

The dependent variable was the economic growth rate of GDP per capita, while the variable representing human capital was the net enrollment rate determining the number of children actually enrolled in schools. The list of variables used in the model along with their characteristics is below in the Table 1.

Table 1. List of variables used in the econometric model

Category	The name of the variable in the database	Description	The name of the variable in the model
Economic growth	GDP per capita growth (annual %)	Economic growth rate of GDP per capita in USD at constant prices for 2010	m_wzrost
Economic convergence	GDP per capita (2010 US$)	GDP per capita in USD at constant prices for 2010	m_pkb
Investment level	Gross capital formation (% of GDP)	The level of investment in physical capital calculated as a % share in GDP	m_inwestycje
Investment in Human capital	Net enrollment rate	The net enrollment rate determines the share of school-age children actually enrolled in schools	m_edukacja

Table 1. (cont.)

Category	The name of the variable in the database	Description	The name of the variable in the model
Healthcare	Current expenditures on health per capita	Current expenditure on health services per capita in USD	sl_zdrowia
Lifestyle	Prevalence of obesity among adults, BMI ≥ 30	The obesity coefficient determines the percentage of population for which the BMI (body mass index) value exceeds 30 points	st_zycia
Physical environment	CO_2 emissions (metric tons per capita)	Carbon dioxide emissions measured in tonnes per capita	sr_fizyczne
Man-made social environment	Intentional homicides (per 100,000 people)	The premeditated homicide rate determines the number of killings inflicted as a result of conflicts and interpersonal violence per 100,000 people	sr_spoleczne
Demographic factors	Age dependency ratio (% of working-age population)	The demographic dependency ratio determines the percentage of persons under 15 years of age or above 64 years of age in relation to persons of working age (15–64 years)	cz_demograficzne
Economic factors	Unemployment rate, total (% of total labor force)	The unemployment rate determining the percentage of people of working age unemployed and actively looking for a job	cz_ekonomiczne

Source: own elaboration based on collected data.

Before proceeding to the estimation of selected variables of health capital, it was necessary to check the significance of the initial model into which further variables could be entered. To this end, the significance of all predictors was tested, the directions of the influence of explanatory variables on the explained theory were compared, and the normality and homoscedasticity of the random component were tested to obtain the correct values of statistics in the model and the most desirable estimators – the BLUE class.

In the next step, parameters of six models were estimated, which is presented and described below. In the estimation, the estimator resistant to heteroscedasticity of residues („robust") is used. Due to the occurrence of atypical observations, dummy variables for selected countries have been added in some estimates. The estimation results are presented in the Table 2.

Table 2. Estimation results for the initial model extended by variables of health capital

		Dependent variable: m_wzrost					
Estimation	**0**	**1**	**2**	**3**	**4**	**5**	**6**
Benchmark model	Impact and significance of estimators (level of significance at: *** < 0.01, ** <0.05, * <0.1)						
m_pkb	−4.0e-05 ***	−7e-05 ***	−4e-05 ***	−2.8e-05 ***	−4.46e-05 ***	−4.45e-05 ***	−4.5e-05 ***
m_inwestycje	0.0838319 ***	0.07456 ***	0.08558 ***	0.07338 ***	0.08990 ***	0.08346 ***	0.0866 ***
m_edukacja	0.0144229 ***	0.01807 ***	0.03134 ***	0.01981 ***	0.01589 ***	0.01537 ***	0.0163 ***
Myanmar	6.21619 ***	6.33371 ***	5.66077 ***	6.27711 ***	6.03022 ***	6.19220 ***	6.0719 ***
Health capital	Impact and significance of estimators (level of significance at: *** < 0.01, ** <0.05, * <0.1)						
sl_zdrowia		0.00032*					
st_zycia			–0.0682 ***				
sr_fizyczne				–0.0697***			
sr_spoleczne					–0.0241***		
cz_demograficzne						−7.93e-05	
cz_ekonomiczne							–0,014157
Ethiopia		4.70680***		4.68465***			
Guinea Equator.		4.41958***		4.27819***			
Cambodia		4.10926***		4.08912***			
East Timor		4.21839***		4.07339***			
R-square	0.742170	0.80571	0.76871	0.805336	0.749305	0.745023	0.751051
JB.	0.137392	0.51798	0.14459	0.677138	0.191532	0.128725	0.125214
Breusch-Pagan	0.34556	0.51074	0.11472	0.869446	0.117832	0.140812	0.377789
N	154	150	133	153	153	152	150

Source: own calculations based on GRETL software.

Among the variables related to health potential, four parameter estimates turned out to be significant, including variables: sl_zdrowia, st_zycia, sr_fizyczne and sr_spoleczne. The insignificant predictors include cz_demograficzne and cz_ekonomiczne.

The parameter estimates obtained in the course of the conducted tests can be interpreted as follows:

– Increase in the percentage of population for which the BMI exceeds 30 points by 1 p.p. will cause the average economic growth rate to decrease by c.a. 0.068 p.p, respectively;

– Pollution and degradation of the physical environment by excessive carbon dioxide emissions into the atmosphere negatively affects growth. The value of the estimator for the variable sr_fiz_1 informs that an increase in CO2 emissions by one tone per person will cause a decrease in the GDP growth rate per capita by c.a. 0.07 p.p.;

– A decrease in security in the immediate human environment, expressed by an increase in the number of premeditated homicides by a thousand, will translate into a decrease in the rate of economic growth by approx. 0.024 p.p.;

– An increase in expenditure on health care increases the rate of economic growth. Increasing expenditures for this purpose by one dollar per capita will increase the GDP growth rate by approx. 0.032 p.p.

In the course of the study, it turned out that 4 out of 6 introduced health capital variables turned out to significantly affect economic growth. It is worth noting that the selection of variables for the model was arbitrary, which means that there may be much more indicators related to the state of health reported regularly, including by WHO or World Bank, which may significantly contribute to the increase or decrease of the GDP per capita growth rate. The direction of impact and the value of the resulting parameter estimates appear to be consistent with economic theory.

According to the authors, these premises point to the need to continue research related to the impact of health capital on economic productivity, both on a micro and macroeconomic scale. An interesting idea might be to create an index for such capital that could aggregate the most representative variables for its individual areas. In addition, the development and creation of such an index could be an interesting alternative to indicators that are most popular in econometric studies, i.e. average life expectancy and adult survival rate.

SUMMARY AND CONCLUSIONS

Health, being a non-material type of capital, is becoming increasingly important for economies, and awareness of its impact on the financial and economic well-being of individuals and societies of individuals and societies is the basis for emphasizing its separateness in economic analyzes. Health capital is defined mainly as the potential for life and health, which with age depreciates and depletes upon death, in which investments can be made through health-promoting policies and conscious human choices. The important features of health capital include that: it can be produced and can be increased through investment, has an impact on human well-being and productivity of the economy, can be considered in terms of demand and supply, is a rare good in relation to human expectations.

The starting point for determining the determinants of health capital is the concept of „health fields" of the Canadian Minister of Health of the 1980s – M. Lalonde, who indicated that human health is affected by: lifestyle (in 50%), environment (25%), genes (15%) and healthcare (10%). Today, the „health fields" model is being analyzed in the broader context of the health of societies. The determinants of health potential include: income and social status; education; physical and social environment (including social support networks), genetics, health care and demographic factors (including generational replacement and gender structure). The quality of capital, which is health, is largely determined by socioeconomic factors and lifestyle. The latter emphasizes the importance of conscious human choices in accordance with „your health in your hands", which should be focused on health-promoting activities.

In order to examine the significance and strength of the impact of health capital on productivity on a macroeconomic scale, an econometric model of economic growth was used and six estimations were made in which the impact of subsequent components of this capital was examined. Data for the model came from the WHO database and the World Bank for 208 countries from 2000–2017.

In the course of conducted research, it turned out that 4 out of 6 introduced variables of health capital significantly influenced economic growth, and their direction is consistent with the economic theory. These include: carbon dioxide emissions in tones per capita (physical), health care expenditure in dollars per capita (sl_zdrowia), the percentage of obese people (lifetime) and the coefficient determining the number of homicides inflicted as a result of conflicts and interpersonal violence per 100,000 people. Insignificant variables in the model were demographic load factor (demographic parts) and unemployment rate (economical parts).

There is no doubt that there may be much more indicators related to health capital regularly reported, including by WHO or the World Bank, which may significantly contribute to the increase or decrease of the GDP per capita growth rate. Creating an index of health capital aggregating the most representative (influential) variables for its individual areas can be an interesting alternative to the previously modeled indicators illustrating the health of societies in economic growth models.

BIBLIOGRAPHY

Arora S., 2001, *Health, human productivity, and long-term economic growth*, „The Journal of Economic History", vol. 61(3).

Barro R.J., Sala-i-Martin X., 2004, *Economic growth*, „Journal of Macroeconomics", vol. 18.

Bhargava A., Jamison D.T., Lau L.J., Murray C.J., 2001, *Modeling the effects of health on economic growth*, „Journal of Health Economics", vol. 20(3).

Bloom D.E., Canning D., Sevilla J., 2004, *The effect of health on economic growth: A production function approach*, „World Development", vol. 32(1).
Cooray A., 2013, *Does health capital have differential effects on economic growth?*, „Applied Economics Letters", vol. 20(3).
Domaradzki J, 2013, *O skrytości zdrowia. O problemach z konceptualizacją pojęcia zdrowia*, „Hygeia Public Heath", no. 48(4).
Easterly W., Levine R., 1997, *Africa's growth tragedy: Policies and ethnic divisions*, „The Quarterly Journal of Economics", vol. 112(4).
Fogel R., 2012, *Explaining long-term trends in health and longevity*, Cambrige Uniwersity Press, Cambridge.
Holland G., 1985, *Techniques of health status measurement using a health index*, Monographs.
Korporowicz V., 2011, *Zdrowie jako kategoria społeczno-ekonomiczna*, „Gospodarka Narodowa", no. 7–8.
Marchewka K., 2000, *Główne nurty w teorii kapitału*, „Ruch Prawniczy, Ekonomiczny i Socjologiczny", z. 3.
Morris S., 2012, *Ekonomia w ochronie zdrowia*, Wolters Kluwer, Warszawa.
Roszkowska S., 2013, *Kapitał ludzki a wzrost gospodarczy w Polsce*, Wydawnictwo Uniwersytetu Łódzkiego, Łódź.
Sachs J.D., Warner A.M., 1997, *Sources of slow growth in African economies*, „Journal of African Economies", vol. 6(3).
Sygit M., 2017, *Zdrowie publiczne*, Wolters Kluwer, Warszawa.
Torrance G.W., 1976, *Health status index models: A unified mathematical view*, „Management Science", vol. 22(9).
Woynarowska B., 2013, *Edukacja zdrowotna: podręcznik akademicki…*, Wydawnictwo Naukowe PWN, Warszawa.
[www1] Encyklopedia Zarządzania, https://mfiles.pl/pl/index.php/Kapita%C5%82 [access 20.05.2019].

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THE IMPACT OF FINANCIAL LEVERAGE ON A COMPANY'S MARKET VALUATION

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Abstract

The purpose of the article is to examine the impact of leverage on the market valuation of companies. The article verifies two hypotheses: 1. the degree of leverage is an important factor that impacts the market valuation of companies; 2. for companies with a high level of leverage, the impact of this leverage on their valuation is negative, and for companies with a low level of leverage, the impact is positive.
The methodology of the study includes a critical literature review and empirical research based on correlation and regression analysis, including univariate and multivariate regression. The analysis covered quarterly data of ten energy companies listed on the Warsaw Stock Exchange. An important component of the research was classifying those companies into several groups, depending on their level of debt ratio in relation to the industry median debt ratio.
The results of the research: The literature review did not provide an unequivocal conclusion to the problem. The empirical analysis did not give grounds to reject the first hypothesis; however, the second one was rejected. The research showed positive correlation and regression coefficients between the debt ratio and the price to book value ratio for highly leveraged companies and negative ones for companies with a low level of debt. The results are surprisingly contrary to the expectations based on theoretical premises.

Keywords: financial leverage, capital structure, company financing, company valuation.

JEL Class: D25, G32.

INTRODUCTION

The ability to accurately assess the value of companies is crucial for making the right investment decisions on the capital market. A company's value is influenced by many factors that determine its effectiveness, as well as the risk to which it is exposed. Such factors include the financing structure, i.e., the degree of liabilities, which is referred to as financial leverage. The significance and direction of the impact of this leverage on the valuation of companies (or on the returns on their shares) have been the subject of research. However, the results are not fully consistent, which may be due to differences in the assumptions made by the authors. The purpose of this article is to analyze these assumptions and to present research that considers the conclusions of this analysis.

1. LITERATURE REVIEW

The early research of Modigliani and Miller, starting with the paper concerning the cost of capital [Modigliani and Miller 1958], is one of the first works that deal with the importance of financial leverage for a company's efficiency. Their research showed that a company's financial structure does not affect its market value; in other words, the degree of debt capital is neutral for the company's valuation by the capital market. However, these early studies relied on a number of strong assumptions, which were later revoked, thus challenging the claim that there is no relationship between the degree of leverage and the value of the company. It also provoked questions about the existence of the optimal capital structure, i.e., one that maximizes value for the company's owners.

Hatfield et al. [1994] refer to research that claims that the optimal capital structure (debt to equity ratio) exists and is strongly related to the average capital structure of the entire industry. It suggests that when companies that issue debt move toward the industry average from below, the market should react more positively than when the company is moving away from the industry average. But their empirical study did not confirm this relationship – they concluded that the market does not appear to consider the relationship between a firm's leverage ratio and the industry's leverage ratio to be important. It should be noted, however, that in the case of companies whose debt before the new debt issuance was higher than the industry average, the issuance of new debt caused a small but statistically significant negative market reaction in the period from 2 to 90 days after the issue.

Hodgson and Stevenson-Clarke [2000] also referred to the concept of the optimal capital structure, discussing the premises of the financial leverage impact on a company's valuation. The first premise suggests a negative impact, as increasing the share of debt in financing a company increases the business's

financial risk. The second indicates a positive impact, as the financial leverage lowers the cost of capital and proves the managers' optimism. The third, which is a synthesis of the first two, is the conviction that there is an optimal level of debt, above which the negative effect related to the risk level outweighs the positive effect that results from the relative „cheapness" of the debt. The fourth option is the classic approach from the theses of Miller and Modigliani, which assumes that the degree of leverage is neutral for the valuation of the company.

Hodgson and Stevenson-Clarke seem to support the thesis about the optimal debt level, and they take it into account in their empirical study, treating the average level of leverage in the industry as the approximation of the optimal structure of capital for this industry. Their study focused on the importance of leverage in analyzing the impact of the company's profits (and, alternatively, its cash flows) on the return on shares; in other words: what is the relevance of the leverage for the quality of the models that explain the impact of profits or cash flows on the rates of return on shares. They conclude that the relative degree of leverage significantly impacts the importance of profit and cash flow valuation; strong leverage affects the relationship between stock prices, book profits, and cash flows.

Another important observation is presented by Nissim and Penman [2003]. They noted that the standard measure of leverage is total liabilities to equity, but the „total liabilities" category is not homogeneous. It consists of financial liabilities (such as bank loans or bonds issued) and operating liabilities. And the operating liabilities can be further divided into contractual liabilities (such as trade payables, pension liabilities) and estimated liabilities (such as deferred revenues or accrued expenses). In their study, Nissim and Penman found that operating and financing liabilities imply different profitability and are priced differently in the stock market. For a given total leverage from both sources, firms with higher leverage from operations have (on average) higher price to book ratios. This means, inter alia, that when examining the impact of leverage on the valuation of companies, the definition of leverage (debt) should not be limited only to financial liabilities.

The problem of risk as a factor that differentiates the influence of leverage on the rates of return on a company's shares has been presented differently by Muradoglu and Sivaprasad [2008]. They examined this impact separately for different risk classes, by which they understood nine main industries. The research results showed that belonging to a given risk class (industry) has a significant impact, both on the strength and the direction (the sign of the coefficient) of the relationship between the degree of leverage and the rates of return on shares. The rates of return on stocks were higher for higher levels of leverage in one of these classes, referred to as „utilities", while for companies in other classes

(industries), the relationship was negative (i.e., an increase in the degree of leverage resulted in decreasing rates of return).

Adding to the study additional explanatory variables (apart from leverage) that represent idiosyncratic risk increased the explanatory power of the model, but the influence of the leverage on the rates of return was still negative. Their approach, in which specific industries are treated as risk classes, is debatable. Each industry undoubtedly includes companies with significantly higher and lower levels of financial leverage, so treating a given industry as a homogeneous risk class seems to be unjustified.

Using all food and beverage manufacturing firms listed on the Indonesian Stock Exchange, Marlina [2013] tested the influence of fundamental factors (earning per share, return on equity, debt to equity ratio, and size) on the price to book value ratio. The results of the regression analysis showed that the debt to equity ratio was among the variables that showed a positive and significant impact on the price to book value ratio.

The study by Gill and Obradovich [2012] examined the impact of several factors (board size, CEO duality, audit committee, financial leverage, company size, return on assets, and internal resources) on the value of American companies listed on the New York Stock Exchange. The results of the regression study showed that the degree of leverage was among the factors that positively impact companies' value. The impact of the examined factors on the value of firms was different for manufacturing companies and for service companies, but in both cases, the impact of the financial leverage was positive.

Similar conclusions come from other studies. In one of them [Rizqia et al. 2013], the authors analyzed the impact of several factors, including financial leverage, on the dividend policy, and on the value of companies. The study covered manufacturing companies listed on the Indonesian Stock Exchange. The study showed a positive and statistically significant impact of financial leverage on the value of companies. Another study [Dita and Murtaqi 2014], also based on companies listed on the Indonesian Stock Exchange, but operating in a different industry (namely, consumer goods), examined the impact of several factors, including debt to equity ratio, on the returns on the stocks of those companies. Again, the impact of financial leverage (represented by debt to equity ratio) on the increase of companies' valuation (which results in the rate of return on shares) proved to be positive and statistically significant.

Contrary results are shown in the study by Acheampong et al. [2014], which analyzed the impact of financial leverage and company size on the rates of return on shares of selected companies from the manufacturing sector listed on the Ghana Stock Exchange. Their study demonstrated a negative and significant relationship between leverage and stock returns when the overall industrial data was used; however, at the individual firm level, the relationship was not stable. For four out

of the five selected companies, the impact was negative; for the fifth one, it was positive.

However, in the study by Adenugba et al. [2016], which examined only the impact of financial leverage on company's value (and based on data from five manufacturing companies from the Nigerian Stock Exchange), the impact proved to be significant and positive. Singh and Bansal [2016] examined the impact of leverage (and other factors) on a firm's financial performance and its valuation. The study covered 58 Fast Moving Consumer Goods (FMCG) companies listed on the National Stock Exchange and Bombay Stock Exchange in India. The results showed that leverage has a significant negative impact on a firm's valuation. Another study [Pandya 2016] is based on data from 197 companies classified as Group A companies listed on the Bombay Stock Exchange. It examines the impact of leverage, expressed as the three different measures (ratios), on the market value added. Univariately, all three measures (namely, debt to equity ratio, debt ratio, and interest cover) proved to be statistically significant in explaining the variation in the market value added of the sample companies. However, when taken together (in multiple regression), only interest cover was found to be statistically significant.

The latest research does not provide an unequivocal solution to the analyzed problem. Hirdinis [2019] presented the examination of the effect of capital structure and a firm size on a firm's value, moderated by profitability. The study was based on the sample of seven companies of the mining sector listed on the Indonesia Stock Exchange. He concluded that capital structure has a positive effect on a firm's value and that the profitability is not able to mediate the influence between capital structure and a firm value.

Ibrahim and Isiaka [2020] examined the effect of financial leverage (long term debt to equity ratio) on a firm's value (Tobin's q ratio) with evidence from a sample of 18 selected companies quoted on the Nigerian Stock Exchange. Other variables were utilized as control variables (pairwise correlation). The regression results showed that financial leverage has a significantly negative effect on a firm's value while the result of the pairwise correlation showed that there is no significant linear relationship between leverage and a firm's value. Financial leverage has proven to be a weak predictor of a firm's value.

PeiZhi and Ramzan [2020] focused their study primarily on exploring the influence of corporate governance structure and the capital structure on firms' market-oriented and accounting-based performance. The study covered 45 selected firms listed on the Pakistan Stock Exchange. The findings showed that the governance structure based on diverse expert members accelerates its performance. It was also found that the leverage ratio improves accounting performance, but it has a downward and significant impact on the share prices of listed firms.

Another research [Lestari et al. 2020] covered all companies listed on the Indonesia Stock Exchange. The subject of the study was the impact of a firm size, leverage (proxy: debt-equity ratio) and profitability on the firm's value (reflected through P/BV ratio). Results showed that leverage has a negative and significant effect on a firm's value. However, the authors indicated that the average value of leverage every year was quite high and experienced rises and falls. A good ratio occured when debt and capital were balanced.

The paper of Jao et al. [2020] presented the analysis of the impact of earning persistence, financial leverage and foreign ownership on corporate reputation and corporate value on non-financial companies listed on the Indonesia Stock Exchange. The authors concluded, inter alia, that financial leverage does not have a significant impact either on the company's value or on the company's reputation.

Research on this problem for the Polish market is difficult to find. There are papers analyzing the impact of financial leverage on a company's performance, but only in book value terms (e.g. impact on profitability or liquidity), while this paper focuses on the impact on company's market valuation. This approach was found only in [Łukasik and Naczyński 2015], who examined the impact of a number of explanatory variables on the dependent variable defined as the market value (capitalization) of companies. The research covered 286 companies listed on the Warsaw Stock Exchange. The multivariate regression analysis showed that the degree of financial leverage (reflected by financial debt to equity ratio) is negatively correlated with the company's value. The authors noted a relatively low level of debt ratios, indicating that Polish companies are cautious in using debt financing.

Summarizing, the literature review does not provide an unequivocal conclusion about the impact of financial leverage on a company's valuation. In general, the studies show that this impact is statistically significant. However, the direction of the impact in some studies proved to be positive (an increase in leverage is accompanied by an increase in the company's value), and in other studies it was negative (a company's value decreases with the increase of leverage). The review of the research also makes it possible to state that the relationship between leverage and a company's valuation is influenced by:

– belonging to a given industry; some studies [Hodgson and Stevenson-Clarke 2000; Muradoglu and Sivaprasad 2008; Gill and Obradovich 2012] indicated it as a differentiating factor, while others limited the scope of companies covered by the study to only one industry;

– the level of leverage in relation to the optimal capital structure; Hatfield et al. [1994] and Hodgson and Stevenson-Clarke [2000] indicated this as an important premise, suggesting that the impact of leverage on a company's valuation may not be stable – it can change (e.g., from positive to negative) with the increase of the level of leverage; surprisingly, other authors did not consider

this aspect, while it may be the main reason for the inconsistency of the research results; only two studies indirectly referred to this problem, mentioning that in the entire sample the average debt level was relatively high [Lestari et al. 2020] or relatively low [Łukasik and Naczyński 2015], which may suggest that in those particular studies the influence of one of the two mechanisms of impact (positive or negative) strongly outweighs the other one for the entire sample;

– factors other than leverage that influence the company's valuation; the research presented in the literature review was often based on a multivariate regression analysis that considered the simultaneous influence of several factors on the endogenous variable.

Omitting or treating differently the factors mentioned here that may affect the nature of the relationship between financial leverage and the valuation of companies may explain the discrepancy in the research results obtained by various authors. These conclusions were considered when designing this study.

2. HYPOTHESES AND RESEARCH METHODOLOGY

Based on the conclusions from the literature analysis, the following two hypotheses were tested:

Hypothesis 1:
The degree of leverage is an important factor that impacts the market valuation of companies.

Hypothesis 2:
For companies with a high level of leverage, the impact of this leverage on their valuation is negative, and for companies with a low level of leverage, the impact is positive.

Correlation and regression analysis were used to verify the hypotheses. The degree of financial leverage, represented in the research by the debt ratio (total liabilities to total assets), is the exogenous variable, and the market valuation of the company, represented in the research by the price to book value ratio, is the endogenous variable. Financial leverage gives the company the potential to increase profitability, but it also results in a degree of financial risk; these two phenomena should translate into the value of the surplus (or deficit) of the market valuation of the company's shares in relation to its book value. Therefore, it was concluded that the price to book value ratio would be the most appropriate measure here.

As noted in the literature review, the relationship between financial leverage and a company's valuation may be influenced by belonging to a given industry and by the level of leverage in relation to the optimal capital structure. Therefore it was decided to limit the research to only one industry and to take the company's leverage deviation from the optimal industry leverage level as a differentiating factor in the analysis. In this study, the optimal capital structure is approximated by the median debt ratio for this group of companies, as suggested by Hodgson and Stevenson-Clarke [2000].

As mentioned above, increasing the scale of a company's financing with liabilities has two effects: beneficial, related to increasing the profitability potential (which is the essence of financial leverage), and disadvantageous, related to increasing financial risk (e.g., the risk of insolvency). It is assumed that for companies maintaining a debt level below the industry optimum the positive effect outweighs the negative one. In that case, the increase of debt, which causes the capital structure to evolve closer to the optimum, should be favorably perceived by investors, and thus it should result in an increase in the valuation of the company's shares (i.e., an increase in the price to book value ratio).

By contrast, for companies that maintain a level of debt higher than the optimum, the assumption is that the negative (risk-related) effect outweighs the positive one (related to the profitability potential). In that case, increasing the debt level further should be negatively perceived by investors and lead to a drop in market valuation of shares (i.e., to a decrease in the price to book value ratio).

The latter mechanism also applies to companies with an optimal debt level. Any change in this level means a move away from the optimum, which should result in a decrease in the valuation of shares, regardless of whether the company is changing its debt level above the optimum (when investors negatively perceive the risk increase) or below (then investors' negative perceptions result from limiting the potential for profitability).

In terms of statistical analysis, the described mechanism means that for companies with a debt level below the industry median, a positive correlation/regression relationship should be expected, while for companies with a debt level equal or higher than the industry median, the expected correlation/regression relationship should be negative.

This research covers the energy industry. There are 11 energy companies listed on the Warsaw Stock Exchange, which are presented in Table 1.

Table 1. Energy companies listed on the Warsaw Stock Exchange

Company name	Name abbrev.	Financial report period	Book value of total assets as in the financial report (million PLN)	Market capitalization as of July 18, 2020 (million PLN)
CEZ a.s.	CEZ	2020/Q1	130,435	43,039
PGE Polska Grupa Energetyczna SA	PGE	2020/Q1	80,970	12,501
Tauron Polska Energia SA	TPE	2020/Q1	42,941	4,364
Enea SA	ENA	2020/Q1	31,895	3,194
Energa SA	ENG	2020/Q1	21,543	3,437
Polenergia SA	PEP	2020/Q1	2,657	2,013
Zespół Elektrowni Pątnów–Adamów–Konin SA	ZEP	2020/Q1	3,317	477
Zespół Elektrociepłowni Wrocławskich Kogeneracja SA	KGN	2020/Q1	2,838	574
Elektrociepłownia Będzin SA	BDZ	2019/Q4	465	34
Inter Rao Lietuva A.B.	IRL	2020/Q1	210	316
ML System SA	MLS	2020/Q1	233	333

Source: www1 and www2, access 18.07.2020.

ML System SA was excluded from the research because its listing on the stock exchange was too short.

The financial data for calculating the debt ratios and ROA ratios were obtained from the Biznesradar database [www1, access 18–31.07.2020]. The price to book value ratio data (for the companies and for the whole market, referred to as the WIG P/BV ratio) was taken from the Stooq database [www2, access 18.07.2020]. Quarterly data for Q3 2013–Q2 2020 were analyzed, which constitutes a time series of 27 quarters for each company.

As the financial reports are published after the day they are drawn up for, the analysis assumes that the level of debt at the end of a given quarter impacts the price to book value ratio in the next quarter. The P/BV ratio values for the quarters were calculated as averages of daily values.

The classification of companies according to their debt level in relation to the industry median debt level was based on the analysis of the deviations of these values (see Table 2), supported by visualization of data in the form of a chart (see Chart 1). Seven companies can be quite clearly classified as having a debt level higher, close to, or lower than the industry median throughout the whole analyzed period. In three cases, however, the deviation from the median in part of

the analyzed period differs significantly from the deviation in the rest of this period (it is particularly visible for BDZ). Therefore, those three companies were labeled „ambiguous".

Table 2. Energy companies classified by their level of debt related to the median level of debt for the analyzed period

Company	Average deviation of debt ratio value from the median debt ratio	Classification of the company's debt ratio in relation to median debt ratio
IRL	0.17	high
CEZ	0.09	high
BDZ	0.16	ambiguous
ENG	0.03	ambiguous
PEP	0.03	ambiguous
ZEP	0.01	medium
TPE	–0.02	medium
ENA	–0.07	low
KGN	–0.13	low
PGE	–0.16	low

Source: own calculation based on www1, access 18–31.07.2020.

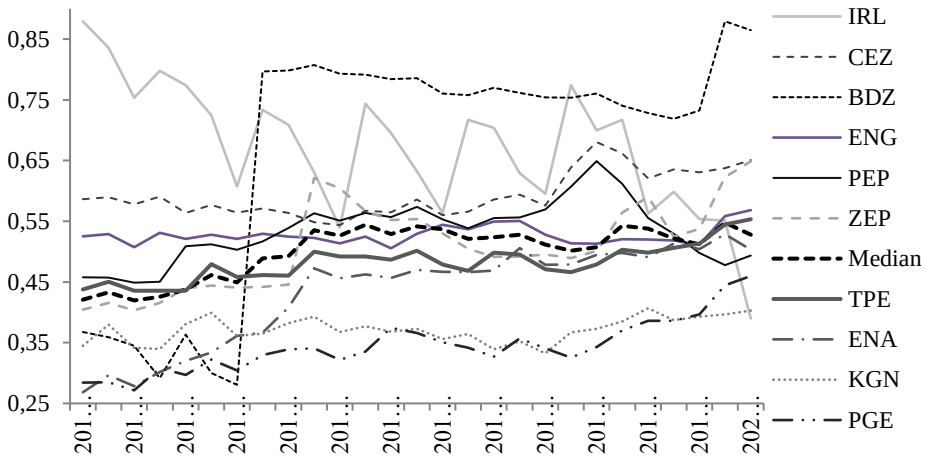

Chart 1. Debt ratio of energy companies and median debt ratio in the analyzed period

Source: own work based on www1, access 18–31.07.2020.

The first part of the research analyzes the correlation (Pearson coefficient) and regression with one exogenous variable (debt ratio). The R^2 measure for univariate regression showed that the explanatory power of these estimations is very low. It suggests that there are other important exogenous variables not included in the regression analysis, and the included variable (debt ratio) may partially „intercept" their impact. For these reasons, multiple regressions are usually analyzed, which is confirmed by the literature review. Therefore, the second part of the research analyzes the multivariate regressions covering two additional exogenous variables that are also probable significant factors that influence the valuation of the company:

– return on assets (*ROA*); the ability of the company to generate profits from its assets is undoubtedly an important aspect investors consider when making decisions on the capital market; and unlike *ROE, ROA* is not directly related to the level of financial leverage;

– the overall price to book ratio of the market, i.e., the ratio calculated for all shares quoted on Warsaw Stock Exchange; the overall sentiment on the market can significantly impact the valuation of individual companies, regardless of their financial performance or capital structure.

The inclusion of additional variables in the regression analysis may show whether the strength or statistical significance of the debt ratio in univariate regression analysis results from this variable „intercepting" the influence of other significant factors.

3. RESULTS

The results of the correlation and regression analysis with one exogenous variable (debt ratio) are presented in Table 3.

The results are surprising. The correlation coefficients and regression coefficients are positive for companies with a high debt level and negative for companies with a low debt level. This completely contradicts the expectations that resulted from theoretical premises based on the literature review. The coefficients are also negative for companies with a debt level close to the industry median (they are the only results that are consistent with the expectations) and for the companies defined as „ambiguous". Moreover, the significance tests (t-stats) show that the debt ratio for most companies is a statistically significant factor that impacts the price to value ratio of companies – only for two of them (Energa and ZEPAK) is the statistical significance of the coefficient's estimation too low. However, the R^2 measure shows that the explanatory power of these estimations is very low; therefore, multivariate regression analysis was also performed. The results of this analysis are presented in Table 4.

Table 3. Correlation and univariate regression analysis

Company	Debt level classification	Pearson correlation coefficient		Univariate regression				
				intercept		coefficient		R^2
		value	t-stat	value	t-stat	value	t-stat	
IRL	high	0.49	2.80	–0.30	–0.33	3.80	2.80	0.24
CEZ	high	0.80	6.77	–1.48	–4.32	3.89	6.77	0.65
BDZ	abiguous	–0.40	–2.20	0.60	7.57	–0.25	–2.20	0.16
ENG	abiguous	–0.09	–0.47	1.37	0.80	–1.52	–0.47	0.01
PEP	abiguous	–0.55	–3.31	2.73	4.76	–3.55	–3.31	0.30
ZEP	medium	–0.07	–0.36	0.27	3.26	–0.06	–0.36	0.01
TPE	medium	–0.80	–6.56	1.77	7.90	–3.05	–6.56	0.63
ENA	low	–0.84	–7.80	0.94	13.36	–1.26	–7.80	0.71
KGN	low	–0.62	–3.93	2.65	5.13	–5.46	–3.93	0.38
PGE	low	–0.86	–8.46	1.69	12.29	–3.34	–8.46	0.74

Source: own calculations based on www1, access 18–31.07.2020 and www2, access 18.07.2020.

Table 4. Multivariate regression analysis

Company	Debt level classification	intercept		coefficient for debt ratio		coefficient for ROA		coefficient for market P/BV		R^2
		value	t-stat	value	t-stat	value	t-stat	value	t-stat	
IRL	high	2.66	1.60	2.23	1.50	–2.82	–2.56	–1.20	–0.96	0.42
CEZ	high	–0.47	–0.58	2.96	3.29	–0.22	–0.21	–0.40	–1.42	0.68
BDZ	abiguous	–0.22	–1.07	–0.23	–2.43	–0.10	–0.97	0.71	4.11	0.52
ENG	abiguous	–0.34	–0.19	0.69	0.21	1.43	1.60	0.44	1.00	0.20
PEP	abiguous	4.02	4.92	–3.36	–3.52	0.85	0.68	–1.22	–2.60	0.56
ZEP	medium	–0.02	–0.15	0.22	1.51	0.11	3.36	0.13	1.56	0.40
TPE	medium	1.18	3.76	–2.61	–5.40	–0.09	–0.51	0.33	2.68	0.72
ENA	low	0.43	3.11	–1.10	–8.02	–0.05	–0.26	0.39	4.07	0.83
KGN	low	–0.27	–0.59	–1.58	–1.76	–0.18	–1.00	1.31	7.93	0.83
PGE	low	1.57	4.84	–3.28	–6.79	–0.06	–0.35	0.08	0.45	0.74

Source: own calculations based on www1, access 18–31.07.2020 and www2, access 18.07.2020.

The inclusion of two additional variables in the regression analysis significantly improved the quality of the estimates (the R^2 measure values are much higher than for the univariate regressions), which confirms that extending the set of exogenous variables is the right direction of the research. The selection of the variable that represents the overall market price to book value ratio is particularly justified. This variable coefficient is statistically significant for five out of the ten companies. The return on assets proved to be a highly significant variable for only two companies, but the significance of the other two variables for these two companies is low, which suggests that ROA is an important factor in those two cases. Nevertheless, the debt ratio remains a variable with high statistical significance for six out of ten companies. For the next three, the t-stat values do not differ much from the level considered sufficient. Therefore, it should be concluded that the degree of financial leverage is one of the important factors considered by the stock market investors that impact the valuation of the companies they invest in.

As for the direction of the impact, the results again proved surprising and contrary to expectations. For companies with a high level of debt, the impact of debt ratio on the valuation of companies is positive, and for companies with a low debt level, this impact is negative. This means that if a company with a high debt ratio increases it even more, then the value of this company (represented by the price to book value ratio) increases, while if a company with a low starting debt level increases the debt ratio, its price to book value ratio decreases.

Summarizing the results of the research, the hypotheses can be verified as follows:

- the high significance of the correlation coefficients, univariate regression coefficients, and multivariate regression coefficients makes it possible to conclude that **there are no grounds to reject hypothesis 1, i.e., the degree of leverage is an important factor that impacts the market valuation of companies**;
- the signs of the correlation and regression coefficients estimated in the research for the debt ratio variable are contrary to what was expected; **it is the basis for rejecting hypothesis 2, i.e., for companies with a high level of leverage, the impact of this leverage on their valuation is negative, and for companies with a low level of leverage, the impact is positive**.

4. DISCUSSION

The conclusions from the literature review did not allow for an unambiguous statement about the direction of the impact of financial leverage on the market valuation of companies. This research confirmed the high statistical significance

of this impact, but surprisingly, the results regarding the direction of this impact are contrary to the theoretical premises. It seems unreasonable for investors to react negatively to an increase in debt financing by a company that has relatively small debt, and to react positively to an increase in debt by a company that is already significantly leveraged. The results of the research suggest that investors indeed act like this, at least in the case of energy companies listed on the Warsaw Stock Exchange. It is tempting to formulate a hypothesis that matches the results, which seems to be internally consistent and statistically significant, and accept it in place of the rejected hypothesis 2. However, this cannot be done because there are no theoretical premises for this. Thus, the conclusions must be limited only to stating that hypothesis 2 must be rejected, and the mechanism assumed by this hypothesis has no empirical evidence.

There were some doubts in the study related to the use of the median as an approximation of the optimal level of debt ratio for all companies in the analyzed industry. Ultimately, however, these doubts are irrelevant because the opposite values of the signs of the correlation and regression coefficients were obtained for companies with clearly extreme (highest and lowest) levels of debt, so the conclusions from the research are also justified without referring to the median value.

The results make the problem even more intriguing. In further research, it would be justified to consider other possible mechanisms of the impact of debt ratio on the market valuation of companies. It may also be reasonable to analyze the correlation and regression, taking into account differently defined variables and/or a different set of variables. This study is a good basis to further explore the topic.

CONCLUSIONS

The study examined the impact of leverage on the market valuation of companies. The literature review does not provide an unequivocal conclusion to the problem; in general, studies show that this impact is statistically significant, but the direction of the impact in some studies proved to be positive, and in others, it was negative. The review made it possible to specify several factors that may influence the relationship between the company's debt and its valuation, like belonging to a given industry, the level of leverage in relation to the optimal capital structure, and factors other than leverage that influence the company's valuation. These conclusions were taken into account while designing the empirical research, which was based on correlation and regression analysis. Classifying the companies into several groups, depending on their level of debt ratio in relation to

the industry median debt ratio, was an important component of the research, omitted in many previous studies, but, as it turned out, very valid.

The empirical data analysis did not give grounds to reject the first hypothesis; therefore, it can be stated that the degree of leverage is an important factor that impacts the market valuation of companies. The situation is different in the case of the second hypothesis, which states that for companies with a high level of leverage, the impact of this leverage on their valuation is negative, and for companies with a low level of leverage, the impact is positive. This hypothesis was verified negatively (i.e., rejected) because the research showed positive correlation and regression coefficients between the debt ratio and price to book value ratio for highly leveraged companies, and negative ones for companies with a low level of debt.

The results of the study are not in line with the previous works. In spite of the fact that other researchers in theoretical parts of their studies emphasized that there are two opposing mechanisms of the influence of leverage on the company's valuation, the conclusions of their empirical research suggest that they expected a homogeneous (only positive or only negative) impact in each case. This paper takes this aspect into account and shows that the analyzed impact is not homogenous and may depend on how far the level of leverage of particular company deviates from the optimal level, which is a new approach to this subject. Alas, the direction of the impact for companies with clearly extreme (highest and lowest) levels of debt turned out to be exactly opposite to what was expected, which also contradicts the previous research. The discussion contains several suggestions that would be helpful in any further study aiming to explain such surprising results.

BIBLIOGRAPHY

Acheampong P., Agalega E., Shibu A.K., 2014, *The Effect of Financial Leverage and Market Size on Stock Returns on the Ghana Stock Exchange: Evidence from Selected Stocks in the Manufacturing Sector*, „International Journal of Financial Research", vol. 5, no. 1.

Adenugba A.A., Ige A.A., Kesinro, O.R., 2016, *Financial Leverage and Firms' Value: A Study of Selected Firms in Nigeria*, „European Journal of Research and Reflection in Management Sciences", vol. 4, no. 1.

Dita A.H., Murtaqi I., 2014, *The Effect of Net Profit Margin, Price To Book Value and Debt To Equity Ratio to Stock Return in the Indonesian Consumer Goods Industry*, „Journal Of Business And Management", vol. 3, no. 3.

Gill A., Obradovich J., 2012, *The Impact of Corporate Governance and Financial Leverage on the Value of American Firms*, „International Research Journal of Finance and Economics", issue 91.

Hatfield G.B., Cheng L.T.W., Davidson W.N., 1994, *The Determination of Optimal Capital Structure: The Effect of Firm and Industry Debt Ratios on Market Value*, „Journal Of Financial And Strategic Decisions", vol. 7, no. 3.

Hirdinis M., 2019, *Capital Structure and Firm Size on Firm Value Moderated by Profitability*, „International Journal of Economics and Business Administration", vol. VII, issue 1.
Hodgson A., Stevenson-Clarke P., 2000, *Accounting Variables and Stock Returns: The Impact of Leverage*, „Pacific Accounting Review", vol. 12, no. 2.
Ibrahim U.A., Isiaka A.Q., 2020, *Effect of Financial Leverage on Firm Value: Evidence From Selected Firms Quoted on the Nigerian Stock Exchange*, „European Journal of Business and Management", vol. 12, no. 3.
Jao R., Hamzah D., Laba A.R., Mediaty, 2020, *Investor Decision in Estimating the Effect of Earning Persistence, Financial Leverage, Foreign Ownership Toward Company Reputation and Company Value*, „International Journal of Financial Research", vol. 11, no. 4.
Lestari E.P., Astuti D., Basir M.A., 2020, *The role of internal factors in determining the firm value in Indonesia*, „Accounting", no. 6.
Łukasik G., Naczyński D., 2015, *Rola struktury kapitału w kształtowaniu wartości przedsiębiorstwa (elementy teorii, doświadczenia praktyki) (The Role of Capital Structure Management (Elements of the Theory, Experience, Practice))*, „Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego. Ekonomika i Organizacja Gospodarki Żywnościowej", nr 112.
Marlina T., 2013, *Pengaruh Earning Per Share, Return On Equity, Debt To Equity Ratio dan Size Terhadap Price To Book Value*, „Jurnal Ilmiah Akuntansi Kesatuan", no. 1(1).
Modigliani F., Miller M.H., 1958, *The Cost of Capital, Corporation Finance, and the Theory of Investment*, „The American Economic Review", vol. 48, no. 3.
Muradoglu G., Sivaprasad S., 2008, *An Empirical Test on Leverage and Stock Returns*, Working Paper Series, Cass Business School, London.
Nissim D., Penman S.H., 2003, *Financial Statement Analysis of Leverage and How It Informs About Profitability and Price-to-Book Ratios*, „Review of Accounting Studies", vol. 8.
Pandya B., 2016, *Impact of Financial Leverage on Market Value Added: Empirical Evidence from India*, „Journal of Entrepreneurship, Business and Economics", vol. 4(2).
PeiZhi W., Ramzan M., 2020, *Do corporate governance structure and capital structure matter for the performance of the firms? An empirical testing with the contemplation of outliers*, „PLoS ONE", no. 15(2): e0229157, https://doi.org/10.1371/journal.pone.0229157 [access 11.12.2020].
Rizqia D.A., Aisjah S., Sumiati, 2013, *Effect of Managerial Ownership, Financial Leverage, Profitability, Firm Size and Investment Opportunity on Dividend Policy and Firm Value*, „Research Journal of Finance and Accounting", vol. 4, no. 11.
Singh A.K., Bansal P., 2016, *Impact of Financial Leverage on Firm's Performance and Valuation: A Panel Data Analysis*, „Indian Journal of Accounting",vol. XLVIII(2).
[www1] www.biznesradar.pl [access 18–31.07.2020].
[www2] www.stooq.pl [access 18.07.2020].