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Corporate governance vs management of the intellectual capital of banks: Structural equation modeling (SEM)

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Empirical Paper

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Corporate governance vs management of the intellectual capital of banks: Structural equation modeling (SEM)

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Abstract:

Objective: The aim of this paper is to identify basic relationships between intellectual capital efficiency in banks, their corporate governance, and their financial performance. Examining these relationships seems justified as up to now the topic has been investigated relatively rarely.

Methods: Structural Equation Modeling was used to accomplish the research objective. The structure of the research tool and the subject matter analysed in the study were drawn from reviews of the subject literature. Quarterly data for the years 2007-2017 published in reports and financial statements of banks listed on the Warsaw Stock Exchange formed the basis for the analysis.

Findings: The results of the conducted analysis do sustain the postulated hypothesis that corporate governance and intellectual capital of banks listed on the Warsaw Stock Exchange have a concurrent, positive impact on financial performance. At the same time the relationship between intellectual capital efficiency and (selected features of) corporate governance turned out to be ambiguous and statistically insignificant.

Practical implication: The proposed model of structural equations may be used to identify the relationship in question, or its lack, in other areas of organisational activity. Furthermore, the study results provide guidelines for executives with respect to intellectual capital management and corporate governance.

Originality/value: SEM is a new, original proposal for measurement and presentation of the relationship between intellectual capital efficiency in banks, their corporate governance, and their financial performance.

Keywords: corporate governance, intellectual capital, structural equation modeling

JEL Classification: G14, G21, G34, M12, O34

1 Introduction

A review of literature shows that intellectual capital is important in the development of every organization, and its methodology is still being developed by many researchers [Edvinsson and Malone, 1997; Blankenburg, 2018; Fazlagić and Skikiewicz, 2018 and others]. The authors emphasize the need to develop an objective method of measuring its value and efficiency of use [Pulić, 2000; Dumay and Rooney, 2016; Sveiby, 2018]. The principles of corporate governance and the importance of their proper implementation are also frequently dealt with in national and international studies [Tricker, 2000; Jerzemowska, 2002; Marcinkowska, 2012; Adamska and Dąbrowski, 2015; Zagorchev and Gao, 2015; Mesjasz, 2016; Plessis et al., 2017; and others]. Multi-aspect research on corporate governance in Polish banks is being carried out [Urbanek, 2013; Słomka-Gołębiowska and Urbanek, 2014]. Topics related to both the management of

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intellectual capital and corporate governance have become the subject of numerous studies, particularly at a time of financial market turbulence. So far, however, these issues were usually addressed separately. A research gap thus exists in the identification of relationships between these issues and of their impact on financial performance. English language studies are few, and their results do not allow wider generalizations in this respect with reference to the Polish context because of the specific nature and distinctness of the Anglo-Saxon corporate governance model. We therefore attempt to answer the following research questions: Do selected features of corporate governance and intellectual capital management impact the financial performance of banks, and if so, to what extent? The answer to this question is not obvious.

In many studies so far, intellectual capital has been presented as a panacea for problems of survival and market success of companies from various branches of industry [e.g., Edvinsson and Malone, 1997; Stewart, 1997]. However, the experience of the 2007–2008 crisis has caused the approach based on emphasizing the role of intellectual capital to come under criticism [e.g., Chaminade and Catusus, 2007]. According to some researchers, the global crisis undermined the heretofore widespread belief that intellectual capital is a factor that guarantees an organization's success. Chaminade and Catusus indicate that, as a result of the influence of the financial crisis, the concept of intellectual capital does not find full application [2007]. In the face of increasing turbulence, the question arises as to what extent intellectual capital can continue to fulfill its task. Experts consider that the global financial crisis also revealed serious weaknesses in corporate governance [e.g., Kirkpatrick, 2009; Strebel and Lu, 2010; Samborski, 2011; Aktan et al., 2018]. The period of financial market destabilization has caused the sayings “you can bank on it” and “too large to fall” to lose their validity. Instances of bank fraud that took place in the last crisis are often accounted for by the lack of sufficient supervision in financial institutions [Karkowska, 2016, p. 609]. As a result, it has become necessary to review the importance of the concept of both intellectual capital and the principles of corporate governance, especially in banks.

The aim of this paper is to establish whether selected features of corporate governance and intellectual capital management in banks impact their financial performance, and if so, to what extent.

The methodological goal is to enrich research methods with a new way of measuring and presenting relationships between the variables: intellectual capital efficiency, corporate governance, and financial results, in terms of their applicability in banks.

A review of the literature of the subject is the starting point for further analysis. Nevertheless, it should be noted that it has the nature of a synthesis, while abroad discussion on corporate governance is still ongoing both in international and in Polish literature [Hilb, 2006; Jeżak, 2010; Adamska and Dąbrowski, 2015; Aluchna and Postuła, 2016; Hanazaki, 2016; Plessis et al., 2017; Switzer et al., 2018].

The remainder of the paper is organized as follows: literature review, description of the methodology, and presentation of the empirical results.

2 Literature review

The literature on corporate governance and owner supervision is so extensive that even an attempt to reconstruct the approaches to writing about it would be an interesting undertaking. The number of conferences and discussions engaged in by theoreticians and practitioners in this field is evidence of the topic's relevance. Academic studies give many different definitions of the term “corporate governance”. Their diversity provides rich analytical material. The terms “ład korporacyjny” (corporate order), “nadzór korporacyjny” (corporate supervision), and “władztwo korporacyjne” (corporate control) are used as translations in Polish literature. The authors also often use the original English term [Federowicz, 2000, p. 25–35; Aluchna, 2007]. A review of the works on corporate governance shows that it is a complex and constantly evolving category. Its multidimensional character and the variety of factors shaping it have produced a wide spectrum of definitions. For the sake of the presented arguments, several of them were quoted. They are the starting point for further analysis.

The definition developed by the Organization for Economic Cooperation and Development (OECD) indicates that corporate governance is a set of relationships among a company's management board, its

supervisory board, shareholders and other stakeholders, determining the company's objectives, the means of achieving them, and the means of monitoring performance [OECD, 2004, p. 11].

According to Cadbury, the pioneer of good corporate practice, corporate governance is a system by means of which companies are run and controlled [1999, p. 12–19].

All the abovementioned definitions primarily emphasize rules, management, and control. In the context of this discussion, the position taken by Mesjasz [2010, p. 355], who underlines that proper corporate order should promote a more effective use of resources and improve the decision-making process, is noteworthy. The author also indicates that problems associated with the definition of corporate governance translate into a lack of unambiguous criteria for its assessment, which should be based on the relationship between corporate governance and the company's operational efficiency [Mesjasz, 2006, p. 53]. Taking into account the specific nature of the conducted research, this position is particularly notable because it underlines the importance of efficient resource use. One of the leading resources of each organization is intellectual capital, in which with the support of appropriate corporate governance practices corporate governance can decide about the success of the entire organization.

It is impossible to disagree with Marcinkowska [2014] that “the fundamental condition for the financial system's stable operation is ensuring financial stability of its institutions and strong practices for its governance.” This is why banks listed on the WSE are investigated in this study. During the last crisis, it was banks that were the focus of economic politicians' attention, and bank management was treated as the most serious challenge for executives. Events of the crisis also launched a heated debate concerned with establishing which resources have a strategic significance in the case of bank operations. The big corporate scandals of a decade ago have been superseded by the much greater problems associated with the financial crisis of 2008 onward [Aras and Crowther, 2016].

As in the case of corporate governance, it is currently difficult to indicate which definition of intellectual capital has gained general recognition as the most accurate.

Sveiby points out that intellectual capital and knowledge management are synonymous, twin branches of the same tree [Sveiby, 2018]. According to Roos, Pike and Fernström, intellectual capital can be defined as “all non-monetary and non-physical resources that are fully or partly controlled by the organization and that contribute to the organization's value creation” [2005, p. 19]. According to Dobija, intellectual capital is “a value of economic means, capitalized in physical and human resources” [2003]. According to the definition proposed by the OECD, intellectual capital is “the economic value of two categories of intangible assets of a company: organizational (“structural”) capital and human capital” [OECD, 2004]. The definition and understanding of intellectual capital by Edvinsson and Malone seem to be the most widespread – it is the starting point for analysis in many publications. According to Edvinsson and Malone, “intellectual capital is the sum of human capital and structural capital” [1997, p. 45].

Already this very concise review of definitions shows that many different definitions are provided with respect to both governance and intellectual capital. This breadth of definitions translates into difficulties in measuring and identifying mutual relationships. At the same time, it implies the need for thorough analysis to establish which of the features of intellectual capital and corporate governance influence the economic results achieved by the company. The wide scope of issues included under topics related to governance makes the selection of variables particularly difficult [Klepczarek, 2016].

To achieve the goals of the paper, the challenge was to identify studies that combine issues of intellectual capital and corporate governance. Anglo-American studies proved dominant in this respect. Therefore, the search focused on English language literature. Research in this area has been conducted among others by Keenan and Aggestam. They state that intellectual resources are strategic assets forming the basis of a company's success and should be protected by appropriate practices within corporate governance [Keenan and Aggestam, 2001, p. 259–275]. The few studies that cover both corporate governance and intellectual capital include those presented by Rodrigues et al. The research team analyzes the influence of the board of directors on the nature of disclosures concerning intellectual capital in the reporting of Portuguese companies [Rodrigues et al., 2017]. Hanazaki [2016] analyzes the impact of changes in corporate order structure on financial performance of Japanese companies, but without taking into account the matter of intangible assets. Switzer et al. [2018] investigated the impact of corporate order on value creation, primarily

taking into account the structure and composition of supervisory bodies in Spanish companies. The growth of an organization's value is often identified with the intellectual capital held by the organization. According to this author, the most important variables that had a positive impact on value creation were size and independence of supervisory bodies. Larger supervisory and management boards have the ability to create "links" with their environment [Garcia-Castro et al., 2010]. When economic environmental conditions are very turbulent, the ability to form a larger number of "links" or relationships with the company's environment helps the company achieve good results. According to Bai et al. [2013], the growth of value is influenced by the autonomy of supervisory board members, particularly in unstable environmental conditions. Aktan et al. investigated the impact of corporate governance on financial performance of companies in Bahrain. Regression analysis showed among others that the percentage of independent directors and board size has a significant impact on Return on Equity (ROE) [Aktan et al., 2018]. Williams also undertook to empirically verify the relationship between intellectual capital and corporate governance and indicates a positive link between, among others, the duality of the chairman role and women's participation in the supervisory board, and results in the area of intellectual capital [Williams, 2000]. Interestingly, further research by Ho and Williams does not show a relationship between selected features of corporate governance and the value-added intellectual capital (VAIC) coefficient [Ho and Williams, 2003, p. 465–491]. In 2012, Zamani et al. undertook to investigate and identify the relationships between selected features of supervisory bodies and the VAIC coefficient, this time indicating a positive link between them [2012, p. 1–7]. The results of studies conducted so far are thus ambiguous and do not permit broader generalization in the Polish context due to different specific nature of the Anglo-Saxon corporate governance model.

This very concise review of the literature leaves no doubt that both corporate governance and intellectual capital management are important issues for banks. Often, these elements determine the improvement of its functioning.

The methodology for measuring intellectual capital, like its definition, is not yet established either in literature on management or in economic practice. In the literature, many authors study the relationship between intellectual capital efficiency and the basic measures of company efficiency using the VAIC coefficient. It measures to what extent and how effectively intellectual capital contributes to value creation, based on connections between physical, human, and structural capital [Pulić, 2000].

The structure of the coefficient is shown by the formula (1.1).

$$\text{VAIC} = \text{VACA} + \text{VAHU} + \text{VASC} \quad (1.1)$$

$$\text{VACA} = \text{VA}/\text{CE} \quad \text{VAHU} = \text{VA}/\text{HU} \quad \text{VASC} = \text{SC}/\text{VA}$$

where VAIC is the value added intellectual coefficient, VACA is the value added capital employed coefficient (value added assets coefficient), VAHU is the value added human capital coefficient, VASC is the value added structural capital coefficient, VA is the value added, CE is the physical and financial capital employed (total assets), HU is the human capital, calculated as the cost of remuneration and employee benefits, and SC is the structural capital ($\text{SC} = \text{VA} - \text{HU}$).

A higher VAIC means a more favorable situation for the company. The coefficient measures the new value created from a monetary unit invested in the resources. A high VAIC indicates a high level of value creation through the use of the company's resources, including its intellectual capital [Fijałkowska, 2012, p. 419].

This method of measuring intellectual capital, applied especially to companies listed on world stock exchanges, is cited in numerous articles. The results of Patton's research [2007] indicate that company efficiency is based on intangible assets and intellectual capital. Maditinos et al. show a positive relationship between human capital and return on assets (ROA) in Greek companies [2011, p. 132–151]. Shui-ying [2008], who investigated the level of intellectual capital in 11 high-tech companies listed on the Shenzhen Stock Exchange in the years 2000–2006, emphasizes the importance of intellectual capital for promoting sustainable development of companies in developing countries. Interestingly and quite unexpectedly, a slight negative correlation between VAIC and productivity and market value was demonstrated by Kujansivu

and Lonnqvist for Finnish companies, and Kamath [2007, p. 272–287] and Williams [2000] for Indian companies. Some studies using VAIC that aim to diagnose relationships between intellectual capital and other economic values related to the enterprise give statistically insignificant results. As a result, further in-depth empirical research becomes necessary, especially on large samples or over a long period of time, to reassess the relevance and usefulness of methods of quantifying intellectual capital and its relationship with economic indicators of company performance over time.

3 Hypothesis and methods

Based on a review of the literature on the subject, a research hypothesis was formulated as follows: intellectual capital efficiency and corporate governance (its selected features) impact the financial performance of banks listed on the WSE.

To achieve the goals of the paper and verify the research hypothesis, a quantitative analysis of relationships between variables was conducted. The structure of the tool was developed on the basis of literature studies. Thematic studies indicate that the most difficult and essential part of structural modeling (structural equation modeling, SEM) is the construction of a theoretical model [Sroka, 2009, p. 198]. This study attempts to construct such a model based on theoretical knowledge derived from the literature on the subject. The causal model proposed in the further part of the study may become a starting point for further empirical verification. To build the model, we used the assumptions of Pulić and the structure of the VAIC ratio he proposes [Pulić, 2000, p. 702–714], with particular emphasis on the two parameters that focus on human capital and structural capital. SEM was applied to assess the strength of the influence on the financial results achieved by banks (or more broadly: their financial situation) of selected features of corporate governance, on the one hand, and of intellectual capital efficiency on the other. The application of SEM makes it possible to “verify hypotheses put forward on the basis of theoretical considerations concerning relationships between these variables, regarding the identification of their occurrence, as well as their strength and direction” [Korol, 2005, p. 30]. The structural equation method is the effect of a combination of factor analysis historically developed mainly in psychology, and modeling of cause and effect equations applied in econometrics [Januszewski, 2011, p. 213–245]. As Januszewski points out, structural equation models allow multidimensional analysis of empirical data pertaining to specific aspects of reality, giving greater possibilities than those offered by classical statistics [2011, p. 213–245]. The features of structural equation models have been presented in detail in the works by Bollen [1989]. The terminology and basic assumptions used in the methodology of SEM model construction have also been added to by Pearl [2000]. In Polish literature on the subject, SEM models have been referenced by Gatnar [2003], Osińska [2008], and Konarski [2010]. The possibility of including hidden variables measured indirectly by many partial indicators in the model is a great advantage of structural modeling, especially for the social sciences where studied phenomena very often cannot be subject to simple measurement [Bedyńska and Książek, 2012, p. 231]. The authors indicate that the SEM methodology allows relationships between independent and dependent variables as well as measurable (observable) and nonmeasurable (non-observable) variables to be taken into account simultaneously. Furthermore, it is possible to include in the model potential errors in the measurement of all observable variables and to estimate and test the variance and covariance between variables, as well as to study direct and indirect relationships between them [Bedyńska and Książek, 2012, p. 231–240].

According to Bollen [1989, p. 303–306], the structure of the SEM model consists of the following:

- an internal (structural) model describing the relationship between hidden variables; this model is a path analysis that allows causal relationships between variables to be determined.
- an external (measurement) model – a model for measuring endogenous and exogenous non-observable variables.

The basic tool used in structural modeling is the path diagram [Bedyńska and Książek, 2012, p. 231–240], which graphically presents causal relationships between variables. The study used the possibilities offered

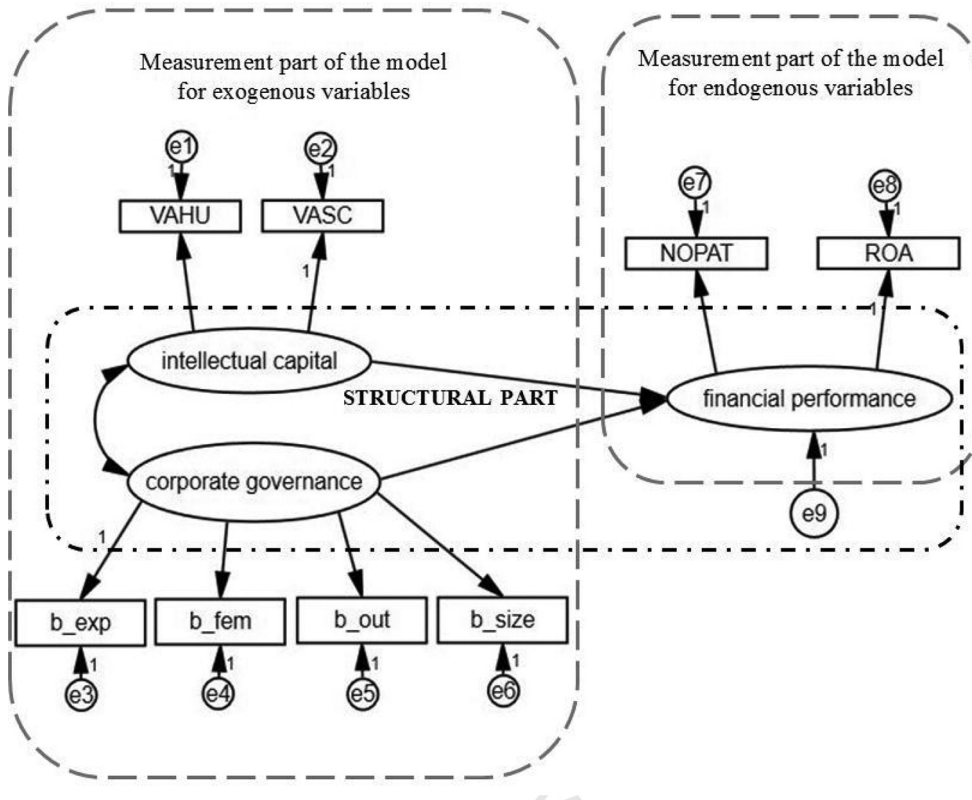


Figure 1. SEM causal model.

Source: Own work.

by Analysis of Moment Structures (AMOS) software together with the Statistical Package for Social Sciences (SPSS) to construct a path diagram. Figure 1 shows the path diagram which is the starting point for further analysis after taking specific variables into account.

The proposed structural model with hidden variables is divided into a structural and a measurement part. The structural part illustrates the postulated relationships between the intellectual capital efficiency, corporate governance, and financial performance of banks. The measurement part, on the other hand, covers indirect measurement of the relationships and variables that are not directly measurable. A hidden exogenous variable, intellectual capital efficiency, is represented by means of two explicit exogenous variables: the value-added human capital coefficient (VAHU) and the value-added structural capital (VASC) coefficient, taken from the intellectual capital valuation method proposed by Pulić [2000, p. 702–714]. The hidden variable does not explain the entire volatility of its subindices, so there is a separate random component “e” for each of them. *Corporate governance* is the second hidden exogenous variable. It is represented by means of four explicit exogenous variables – participation of experts (b_exp), participation of women (b_fem), participation of outside directors (b_out), and size (b_size) of the supervisory board. With respect to corporate governance, the focus was on four explicit exogenous variables, but the number is not closed (features such as the dual role of the president, typical of the Anglo-Saxon model, were rejected). Inclusion of the indicated features of corporate governance is dictated by the need to verify previous literature research. At the same time, the choice of variables is limited by requirement of model traceability.

To quantify the *financial performance* variable, we referred to the literature, in which this term is taken to mean: “financial condition of an economic entity in a given time interval expressed by its solvency, ability to generate profits and increase property and capital resources” [Kowalak, 2003, p. 11]. Two explanatory endogenous variables have therefore been proposed – net operating profit after tax (NOPAT) and ROA. ROA is calculated as net income/total assets. This represents the return generated by the use of the firm’s assets. It is shown as a percentage.

Verification of the normality of variable distribution in the proposed model allowed the maximum likelihood method to be applied for further estimation. This is one of the estimation methods implemented in the AMOS package, along with the method of generalized least squares and the asymptotically distribution-free method.

The study covered banks operating in Poland and listed on the WSE throughout the whole analyzed period, i.e., in the years 2007–2017 (Bank Millennium, BOŚ, BPH, BZ WBK, Getin Holding, Getin Noble Bank, Bank Handlowy, ING Bank Śląski, MBank, Pekao, PKO BP). The selection of the sample was influenced not only by substantive reasons but also by limitations related to the availability of source data (exclusion of UniCredit Italiano S.A. and inclusion of Alior Bank data from 2013 – stock exchange debut in December 2012). It was mainly banks that drew the attention of economic politicians and were treated as the most serious challenge for managers in the economic slowdown and crisis. The great significance of the valuation of intellectual capital in banks is also related to the intangible nature of banking services. It is not negligible that banks, which had been so far worldwide considered model institutions with respect to best practices in management, were the source of the crisis that imposed the necessity of adopting a new perspective on matters of corporate order [Diaz et al., 2018]. Moreover, banks are subject to strict prudential regulation of their capital and risk. This is reflected in corporate order practices.

The analysis was based on quarterly data published in reports, financial statements, and stock quotes of these banks (the sample is made up of 450 observations, allowing estimation using the maximum likelihood method within the AMOS package). Table 1 presents the selected estimates of intellectual capital efficiency and corporate governance features in the last year of analysis. Although individual banks operate under similar conditions, they achieve different financial results. The question of what factors determine their economic success thus arises. Results of previous research [Komnenic and Pokrajcic, 2012; Chen et al., 2005] indicate that only a part of the effects of economic activity can be attributed to real or financial capital outlays. As Grudzewski and Hejduk emphasize, it is impossible to overestimate the identification of factors that contribute to the creation of a company's value, including that of a bank [Grudzewski and Hejduk, 1999, p. 66]. As underlined in numerous studies and indicated in the previous subsection, intellectual capital is one of the key resources.

4 Research results

The proposed conceptual model can become a starting point for further verification of the empirical relationship among intellectual capital efficiency, the attributes of banks' corporate supervision, and the financial performance of these banks. The described model allowed relationships that are quite diverse to be shown. Model estimation results are presented in Figure 2. The obtained estimates of model parameters indicate the existence of relatively strong relationships between the hidden exogenous variable (intellectual capital efficiency) and its VAHU and VASC coefficient variables. Strong relationships may be observed in the case of the second exogenous variable – corporate governance. As for the hidden endogenous variable, the NOPAT coefficient had less significance for its description than ROA.

Based on the relationships presented in Figure 2, it may preliminarily be said that intellectual capital efficiency influenced the financial performance of banks in the analyzed period. This is not the case for the corporate governance variable, defined by four attributes – participation of experts (b_exp), participation of women (b_fem), participation of outside directors (b_out), and size (b_size) of the supervisory board.

The proposed model shows relatively strong and statistically significant relationships between hidden exogenous variables and their coefficient variables.

In the description of intellectual capital variable, human capital efficiency (changes in human capital efficiency account for 97% of variability in the level of intellectual capital efficiency of the banks) and structural capital efficiency (comparable changes in structural capital efficiency account for 93% of variability in the level of intellectual capital efficiency of the banks) have a similar significance. Analysis of the relationship between the financial performance variable and its coefficient variables shows that the greatest importance should be attributed to the ROA (value of 0.84). NOPAT (value of 0.60) had a smaller

Table 1. Selected estimates of intellectual capital efficiency and features of corporate governance for the causal model for the period I Q 2017–IV Q 2017

2017	Q	CE	HU	NOPAT	Assets	VA	VAHU	VASC	VAIC	b_exp	b_fem	b_out	b_size
BGZBNPP	I Q 2017	6,260,680	216,103	39,563	71,598,515	395,524	1.8302	0.4536	2.3470	11	1	2	11
BGZBNPP	II Q 2017	6,381,018	197,108	81,216	71,975,471	421,350	2.1376	0.5322	2.7358	11	1	2	11
BGZBNPP	III Q 2017	6,472,556	210,200	109,790	71,900,179	467,083	2.2220	0.5500	2.8442	11	1	2	11
BGZBNPP	IV Q 2017	6,559,463	208,594	49,138	72,749,259	381,863	1.8306	0.4537	2.3426	11	1	2	11
ALIOR	I Q 2017	6,311,701	265,971	82,361	60,419,868	476,898	1.7930	0.4423	2.3108	7	0	1	7
ALIOR	II Q 2017	6,388,139	267,229	99,761	61,837,078	427,688	1.6004	0.3752	2.0425	7	0	1	7
ALIOR	III Q 2017	6,606,503	206,243	178,175	68,039,212	573,320	2.7798	0.6403	3.5068	7	0	1	7
ALIOR	IV Q 2017	6,760,527	275,673	175,180	69,493,780	612,231	2.2208	0.5497	2.8611	7	0	1	7
HANDLOWY	I Q 2017	684,860	132,602	42,656	44,762,276	227,312	1.7142	0.4167	2.4628	12	1	7	12
HANDLOWY	II Q 2017	6,482,825	101,605	157,983	44,592,483	322,811	3.1771	0.6852	3.9121	12	1	7	12
HANDLOWY	III Q 2017	6,706,322	127,318	171,566	44,228,329	367,433	2.8859	0.6535	3.5942	12	1	7	12
HANDLOWY	IV Q 2017	6,938,883	154,838	163,361	43,037,596	383,279	2.4753	0.5960	3.1266	12	1	7	12
ING BSK	I Q 2017	10,787,300	251,000	300,200	118,850,500	790,300	3.1486	0.6824	3.9042	7	3	3	7
ING BSK	II Q 2017	11,154,100	248,100	360,400	120,197,600	849,400	3.4236	0.7079	4.2076	7	3	3	7
ING BSK	III Q 2017	11,486,200	260,600	375,700	122,290,000	881,400	3.3821	0.7043	4.1632	7	3	3	7
ING BSK	IV Q 2017	11,794,800	263,500	366,800	126,013,900	896,500	3.4022	0.7061	4.1843	7	3	3	7
PKO BP	I Q 2017	33,349,000	735,000	525,000	288,516,000	1,962,000	2.6693	0.6254	3.3536	10	2	7	10
PKO BP	II Q 2017	34,352,000	581,000	857,000	286,389,000	2,154,000	3.7074	0.7303	4.5003	10	2	7	10
PKO BP	III Q 2017	35,352,000	664,000	902,000	289,961,000	2,302,000	3.4668	0.7116	4.2435	10	2	7	10
PKO BP	IV Q 2017	36,267,000	660,000	820,000	296,912,000	2,225,000	3.3712	0.7034	4.1359	10	2	7	10

Source: Own work based on bank reports and consolidated financial statements.

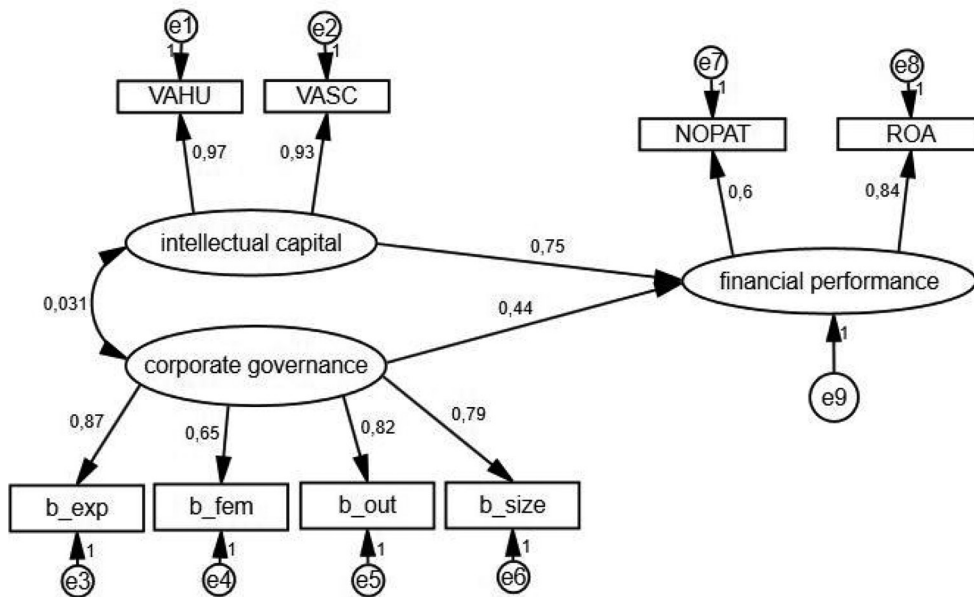


Figure 2. Model of structural equations for quarterly data Q1 2007–Q4 2017.

Source: Own work using AMOS software.

significance in the analyzed period. Thus, it may be said that in the examined period, changes in the ROA coefficient explained the variability of the financial results achieved to a greater extent than the value of the NOPAT variable. Moreover, there is a slight and statistically insignificant relationship between the exogenous variables (value of 0.031).

As regards the assessment of the quality of the proposed model, the value of the minimum fit function (FMIN) is 0.077. This is a measure of mismatch between the model and real data. A low value indicates a good fit, while a high value indicates that modification of the model is needed. It measures the discrepancy between the observable variance–covariance matrix and the theoretical variance–covariance matrix resulting from the model and the already estimated values of the parameters [Bedyńska and Książek, 2012, p. 183]. FO is the value of the function of the discrepancy between the variance–covariance matrix from the model and the matrix from the population [Bedyńska and Książek, 2012, p. 186]. The value of this function is 0.065, and its 90% probability range is (0.010, 0.206), so it contains the desired value of 0.065, i.e., the model can be considered to reconstruct the population of the variance–covariance matrix relatively well, and thus it describes true relationships between variables.

Analyzing the main focus of the model, namely the impact of variables describing intellectual capital and corporate governance on the financial results of banks, it should be stated that these results were significantly affected by intellectual capital efficiency. The most important information from the perspective of the purpose of the study also concerns the influence of the exogenous corporate governance variable on the endogenous financial performance variable. Surprisingly, in this case, the coefficient equaled only 0.44. This relationship is difficult to assess unequivocally, and it should be remembered that determining the nature of the relationship observed here requires further in-depth exploration.

5 Conclusion

Summing up, the conclusion may be made that there is a need for further research or improvement in the existing quantitative or qualitative methods of quantifying intellectual capital and corporate governance to ultimately achieve a standardized, consistent method of measurement, allowing multidimensional comparisons. Bearing in mind that the literature on the subject suggests different ways of calculating the value and efficiency of intellectual capital, verifying to what extent the results of their application provide similar directional guidelines in the area of intellectual capital management is also indicated.

Due to significant limitations on drawing conclusions concerning the application of the VAIC coefficient, it also becomes necessary to establish whether the methods of quantifying intellectual capital presented in the literature reflect the same behavioral trend and provide a similar ranking of banks from the perspective of held and valued intellectual capital and its efficiency.

Although the study results confirm the theories cited above stating that intellectual capital has a fundamental importance for companies irrespective of industry, full verification of the postulated hypothesis requires further exploration. To reiterate, the results of the analysis conducted do sustain the postulated hypothesis on concurrent positive impact of corporate governance and intellectual capital of banks listed on the WSE in the years 2007–2017 on financial performance. The results obtained turned out to be ambiguous, and the relationship between intellectual capital and corporate governance turned out to be statistically insignificant.

We are aware that the conducted study, which resulted in this paper, is based on a simplified approach that assumes a series of generalizations. At the same time, it should be noted that the measurement performed here will not reach the level of measurement appropriate for mathematical sciences. However, on the other hand, the high generality of the presented model gives room for maneuver for further verification of this issue. It is also the starting point for the construction of more extensive variants. The proposed causal model may be used to identify relationships or their lack in other areas of research. The question emerges whether the results obtained for banks arise from research sample selection. Intellectual capital and corporate governance researchers thus face serious challenges, particularly in the context of dynamic change and a crisis of confidence in financial institutions. Identifying actions that should be taken to ensure conditions conducive to creation of intellectual capital with the support of corporate governance is particularly important.

When designing a more detailed research process in future, it will be justified to divide the study period into a period of crisis and a period of stability on the financial markets. Such a move will allow deeper analysis of the causal relationships between the studied variables in different economic situations. In consequence, the results of such an analysis will make it possible to indicate actions and mechanisms that may be recommended with respect to corporate governance and intellectual capital management in special economic conditions. Moreover, the relationships identified in this area may provide further recommendations for managers of banks. If current recommendations concerning the need to manage intellectual capital and introduce principles of corporate governance in banks are valid, the slowdown or destabilization period should differentiate the situation of banks in which the level of intellectual capital management and scope of corporate governance is high and those in which it is low. These issues are particularly important for different groups of stakeholders, theoreticians, and practitioners. The current study and its results may, together with a more detailed model, form the basis for the construction of an integrated model.

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