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CONTENTS

GOVERNANCE OF STAKEHOLDER'S FINANCIAL RELATIONSHIPS: EVIDENCE FOM UKRAINIAN BANKING SECTOR

Maryna Brychko*

Abstract

This paper makes two related contributions to corporate finance theory and stakeholder theory. First, the author intend to examine relationship between sustainability of stakeholders' financial relations and efficiency of corporate governance, taking into account lagging of decision-making corporate governance in banks to it financial performance. Second, the author seeks to prioritize stakeholders' financial relations of the emerging stakeholder model of corporate governance at banks by analyzing two relevant dimensions of this model: contribution valued resources to the bank and power that the stakeholders have within the bank. The findings confirm that efficiency of bank management in the system of stakeholder's financial relationships in absolute efficiency of corporate governance achieved solely through sustainable financial relations of "principal-agent" (where principals are individuals and agent is apparatus of corporate governance). The results show that the role of individuals as sub-agents, enterprises as principals and sub-agents, shareholders as principals formed negative effect.

Keywords: Financial Relations, Stakeholders, Corporate Finance, Corporate Governance, Corporate Efficiency, Bank Management

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1. Introduction

Preliminary analysis of economic theory formed an idea of causal relationships between stakeholders' financial relations of the bank and corporate governance as a part of the bank management at a qualitative level. Mathematical modeling is widely used in various fields of knowledge: mechanics, physics, medicine, biology, chemistry, economy. There are determinist and stochastic modeling. If in quantities analyzed by deterministic models their stability is expected and random deviations are omitted attributing them only on observations and measurements errors, then random character of variables estimated by probable methods is based in stochastic models. Here the task is to find trends that occur in random efficiency deviations of commercial banks.

Deterministic models describe patterns that appear in the separate bank of Ukrainian banking system. Such regularities inherent strong mechanical causality that specifically defines the behavior of each bank. It was called dynamic pattern or pattern with solid determination. In dynamic patterns the relationship between cause and effect can be expressed quite accurately in specific mathematical formulas. Here, each set of values of the explanatory variables always corresponds to definite values of explanatory variable. This relationship is called functional. Deterministic model is the expression of functional relationships.

In the centralized planned economy were widely used deterministic models. The result was known in advance and the theory was intended for it justification. Mainly balance or optimization models were used: interbranch balance and linear programming.

Under conditions of market economy the result of the bank management is unknown beforehand and it is impossible considering the randomness. Economic phenomena and processes are the result of many simultaneously and collectively acted reasons. When considering the relationships between them the main reasons that necessarily lead to this outcome should be distinguished from secondary. Last reasons impede and distort significant effect in this respect of reasons. Moreover, the reasons may have unpredictable character. For example, in banking daily cash flows are formed influenced by certain patterns (scheduled payments), as well as unnecessary and sometimes unforeseen financial relationship of bank stakeholders, which ensure costs and revenues, receipts or payments. Thus, economic processes have probable nature and the development of the investigated object is determined by the total impact of patterns and randomness.

To separate the essential factors acting on the bank from the minor and accidental factors, observations should be repeated and massive. Patterns that revealed under mass observations are called statistical observations. Statistical patterns are also reason-conditioned as dynamic one, but it can be caused by a set of reasons and they are mutually

connected and act in different ways [2]. The probability of obtaining the particular result is zero. In such situations it is possible to define only an interval in which the value of studied parameters with predetermined probability falls. Detecting statistical patterns, determining interval estimates of unknown parameters and test of different hypotheses are made by methods of mathematical statistics.

Stochastic models describe patterns which are caused by the simultaneous action into the object of many factors which appear clearly only in mass observations. To the most common methods for building stochastic models we can include methods grouped under the general title - multivariate statistical analysis, in particular - correlative and regression analyzes. Detection of quantitative relations in the form of regression enables a better understanding of the nature of the phenomenon. This allows influencing the identified factors, interfering in the proper economic process in order to obtain the desired results.

Classical regression analysis describes the economic processes by means of a single regression equation. This equation is not functional, but stochastic. In this equitation to each set of explanatory variables may correspond several values of explanatory variables simultaneously. The equation should contain only significant explanatory variables. Uncontrolled or unmeasured factors, as well as errors of measurement are included in the random term (random variation). It is assumed that the explanatory variables are not random and are not correlated with each other and the random component has a diagonal variance- covariance matrix with equal diagonal elements.

Often in order to describe economic processes with a single regression equation is not enough through many causes and effects. For a more adequate reflection of real relations in economic processes it is necessary to use a system of regression equations. Applications of based tests for testing the hypothesis of the form variance-covariance matrix of the random deviations showed that the calculated values of random member of regression in many cases (especially in the analysis of time series) reject the basic assumptions of the classical regression analysis. The idea of the relationship between economic variables and assumptions about the general form of variance-covariance matrix of random has led to the creation of a new type of stochastic models that became known as econometric [3].

Thus, we propose to use the linear model considering decisions of corporate governance in value added growth based on creating bank stakeholders financial relations that allows determining and estimating the importance of financial relationships of key stakeholder groups that can affect the success of the management of the banks in the system of financial relations [4]. The current model also allows considering the influence of hard managed factors of direct impact on the primary (easily managed) financial stakeholder relations, thus, determining the probability that the role of financial relations of different groups of stakeholders do not coincide and, therefore, has a negative impact.

2. Data and empirical definitions

Let's consider the work of N banks over the period of T years. We have vector x_{ij}, consisting of $(m+1)$ factors that affect the work of *i-th* bank for *j-th* year. Bank' management performance in the system of financial relationships of their stakeholders is expressed by the corporate governance effectiveness; n banks for a period of T years we denote by the matrix F, whose values φ_{ij} responsible for bank *i-th* and *j- th* year. Values φ_i are range from one to infinity, reflecting the approach of each bank to the efficiency limit. In this case, we consider that the best option when the value of the corporate governance effectiveness is equal to one. Hence, it is necessary to find such set of vectors x_{ij}, that all values $\varphi_{ij} = 1$, where $i = 1..$ N and $j = 1..$T. Progress in solving this problem will consist of two sub-tasks:

1) building a model that will show the connection between parameter vector x_{ij}, and values of φ_{ij} matrix F;

2) finding of the optimal values of some parameters x_{ij}, to perform condition all $\varphi_{ij} = 1$

To determine the view of the model it is necessary to analyze certain statistical information. The simplest is linear parametric model. In economics there are many examples of such models (Leontiev model, Solow model). To find the unknown parameters of the linear model the method of least squares (*MLS*) is used [1]. The quality of the model will be measured by the coefficient of determination (R^2). For example, let's consider bank performance for *j-th* year. Then the regression equation will be following

$$\vec{y} = \vec{X}\vec{a} + \vec{u}.$$

$$\vec{y} = \begin{bmatrix} \varphi_{1j} \\ \varphi_{2j} \\ \vdots \\ \varphi_{nj} \end{bmatrix}, \quad \vec{u} = \begin{bmatrix} u_1 \\ u_2 \\ \vdots \\ u_n \end{bmatrix}, \quad \vec{a} = \begin{bmatrix} a_0 \\ a_1 \\ \vdots \\ a_m \end{bmatrix}, \quad \vec{X} = \begin{bmatrix} x_{10j} & x_{11j} \dots x_{1mj} \\ x_{20j} & x_{21j} \dots x_{2mj} \\ \dots\dots\dots\dots\dots\dots \\ x_{n0j} & x_{n1j} \dots x_{nmj} \end{bmatrix}, \tag{1}$$

Where,
φ_{ij} – value of the integral indicator of corporate governance effectiveness for *i-th* bank and *j-th* year;
u_i – random component of the model;
a_i – measured parameters of the model;
x_{ij} – factors of influence that expressed by stakeholders financial relationships of *i-th* bank for *j-th* year.

It is assumed that in linear regression models random observations should be such that the number of degrees of freedom $l = n - m - 1$ is greater than *0*, and the matrix $\vec{X}$ has full column rank $m + 1$. In this case the transposed matrix rank is also equal to $m + 1$, and the symmetric matrix of dimension $(m + 1) \times (m + 1)$ has a rank equal to $m + 1$, and hence, there is an inverse matrix $\left(\vec{X}'\vec{X}\right)^{-1}$.

It may be noted that the system of linear equations (1) which are determined by MLS-estimator $\hat{a}_0, \hat{a}_1, ..., \hat{a}_m$, can be written as

$$\vec{X}'\vec{X}\vec{\hat{a}} = \vec{X}'\vec{y} \tag{2}$$

where, we find a column vector of unknown MLS-estimators. We have

$$\vec{\hat{a}} = \left(\vec{X}'\vec{X}\right)^{-1}\vec{X}'\vec{y} \tag{3}$$

So, vector estimation $\vec{\hat{a}}$ we can determine using formula (3).

The following equations (4-8) characterize vector estimation $\vec{\hat{a}}$

$$\vec{\hat{a}} = \vec{a} + \left(\vec{X}'\vec{X}\right)^{-1}\vec{X}'\vec{u} \tag{4}$$

$$M(\vec{\hat{a}}) = \vec{a} \tag{5}$$

$$\vec{\Sigma} = D(\vec{\hat{a}}) = \sigma_u^2\left(\vec{X}'\vec{X}\right)^{-1} \tag{6}$$

$$\vec{\hat{\Sigma}} = \hat{D}(\vec{\hat{a}}) = \hat{\sigma}_u^2\left(\vec{X}'\vec{X}\right)^{-1} \tag{7}$$

$$\hat{\sigma}_u^2 = \frac{\vec{\hat{u}}'\vec{\hat{u}}}{n-m-1}, \quad \vec{\hat{u}} = \vec{y} - \vec{X}\vec{\hat{a}}. \tag{8}$$

Equation (4) shows that the MLS–estimators $\hat{a}_0, \hat{a}_1, ..., \hat{a}_m$ are linear for perturbations and, therefore, have the same distribution law as the perturbation. Assuming that the disturbances are normally distributed, the mentioned quality allows us to build confidence intervals for the regression coefficients.

From the equation (5) implies fixity of MLS – estimation $\vec{\hat{a}}$. It can be shown that the MLS – estimation $\vec{\hat{a}}$ is also effective and reasonable. Estimation efficiency means that of all possible linear fixed estimates, estimates $\hat{a}_0, \hat{a}_1, ..., \hat{a}_m$ have minimum dispersions which are equal to the

corresponding diagonal elements of the covariance matrix $\vec{\Sigma}$ (6). The validity of estimation $\vec{a}$ means that covariance matrix $\vec{\Sigma}$ attached to *n* is reduced to zero matrixes. If according to the formula (8) we have estimation $\hat{\sigma}_u^2$ disturbances dispersions σ_u^2, then, the estimated covariance matrix can be calculated according to the formula (7).

As noted above, the quality of the regression model we will characterize by the coefficient of determination, which in case of linear regression is indicated R^2. The meaning of determination coefficient is given by the formula 9.

$$R^2 = 1 - \frac{\sum \hat{u}_i^2}{\sum (y_i - \bar{y})^2} \tag{9}$$

According to the formula (9) R^2 is defined as a unit minus the quotient of the sum of squared errors on the sum of squared deviations from the sample average. It is known that the coefficient of determination ranges from zero to one ($0 \le R^2 \le 1$).

Also, we can say that the value R^2 (in percent) means that the linear model (1) explains R^2 % of the total regression dispersion, the rest *(1 -* R^2 *)* are not specified in percentage by linear model. From the formula (4) implies the following: minimizing error function by the method of least squares is equivalent to maximizing of determination coefficient R^2. The closer ceteris paribus value R^2 to 1, the better the estimated regression equation and thus, better quality of the obtained model.

The need to consider lags occurs while modeling many dynamic processes. Therefore, we believe it is necessary to take into account the lags in banking in the system of financial relations, including lagging of corporate governance in banks. In general, if some variable appears in the model with the delay for *s* periods, then it is called lag and is written with subscript $t - s$ and has a lag of length *s*.

During model building we define three types of lagged variables:

1. Lagged independent variable. The value of explanatory variables x_{ij} and $x_{i(j-1)}$ are closely correlated because they represent the same set of observations with a lag in one period. Therefore, in models with lagged independent variables there is a phenomenon of multicollinearity.

2. Lagged dependent variable. In such situations, the variable φ_{ij} is both explicable and explanatory. Thus, explanatory variable φ_{ij} is stochastic.

3. Lagged residual variable. If there is dependence between values, the model has autocorrelation.

The next step will be the specification of the model. Let's consider the statistics over 6 years (2007-2012) for 50 banks which represent about 63% of the entire banking system. Banks were chosen due to limited information for analysis, however, the banks included in the sample under control both foreign and domestic capital and includes state-owned banks. For each bank we have 12 performance indicators (11 factors that characterize financial relationship of bank stakeholders and influence on the bank management, whilst the integral indicator of the corporate governance effectiveness, which characterizes the efficiency of banks activities in the system of financial relations of their stakeholders).

Primary and secondary factors that are considered easily and hard managed characterize stakeholders' financial relationship of bank on the formation of own or borrowed capital and also, financial relationships connected with the process of distribution and redistribution of financial resources in order to increase the value added of the bank are shown in Appendix A.

In order to build the model between factors x_{ij} and efficiency of corporate governance φ_{ij} for some *j-th* year we consider general linear model (10) and 5 different types of linear models with lagged variables (10-15). The first model in the general form as follows:

$$\vec{y}_j = \vec{X}_j \vec{a}_j \tag{10}$$

This is a linear model that ignores the effects of the previous years for the value of the commercial banks performance management. It is the simplest and therefore, not always well describes the statistical information.

The second model considering the lagged variables

is as follows

$$\vec{y}_j = \vec{X}_j \vec{a}_j + \beta_j \vec{y}_{j-1} \tag{11}$$

where β_j – a coefficient for *j-th* year.

For this model a lag of dependent variable y_{j-1} is typical. Lagged variable y_{j-1} means that the result of the effectiveness of bank management is expressed by the efficiency of corporate governance of the bank this year depends on its effectiveness in the previous year.

If $\beta_j = 0$, it means that the value for the previous year does not impact on the effectiveness of corporate governance of the bank this year, and equality $\beta_j = 1$ indicates a high effect of prior to the next.

The third model is represented by equation 12 and considering the lagged dependent variables for two periods

$$\vec{y}_j = \vec{X}_j \vec{a}_j + \beta_j \vec{y}_{j-1} + \beta_j^2 \vec{y}_{j-2} \quad (12)$$

In this model the length of a lag for the dependent variable is two, and the coefficient is chosen as β_j^2. This choice is explained by a decrease in the impact factor with increasing lag length, i.e., the dependence of the efficiency of the bank corporate governance for a year from value for 2 years ago is less than 1 year ago.

The fourth model considering the lagged independent variable is as follows:

$$\vec{y}_j = \vec{X}_j \vec{a}_j + \alpha_j \vec{X}_{j-1} \quad (13)$$

where α_j – a coefficient for *j-th* year.

This model has lagged independent variable X_{j-1}. This means that the model has dependence on the values of the factors for the previous year. Moreover, the coefficient αj must belong to the range $0 < \alpha_j < 1$. This coefficient shows the dependence power of banks corporate governance on the values of the factors for the previous period. If $\alpha_j = 0$, it means that the factors mentioned in the previous period have no significant effect on the effectiveness of the bank corporate governance and the equality $\alpha_j = 1$ indicates its high impact.

The fifth model is shown in equation 14.

$$\vec{y}_j = \vec{X}_j \vec{a}_j + \alpha_j \vec{X}_{j-1} + \beta_j \vec{y}_{j-1} \quad (14)$$

For this model lags of independent variable X_{j-1}, as well as dependent y_{j-1}.one is typical.

The sixth model is represented by the following equation:

$$\vec{y}_j = \vec{X}_j \vec{a}_j + \alpha_j \vec{X}_{j-1} + \beta_j \vec{y}_{j-1} + \beta_j^2 \vec{y}_{j-2} \quad (15)$$

This model is the most complex and takes into account the largest number of lagged variables, namely the lagged independent variable X_{j-1}, lagged dependent variables y_{j-1}, y_{j-2}. This means that the factors mentioned in the previous period, the result of effective management of banks expressed by the efficiency of the bank corporate governance for the previous two periods influence the effectiveness of the bank corporate governance this year.

All the models mentioned above can describe the situation that will be solved in the process. But for every year we'll choose a suitable model that would have the best quality. It is necessary for the further study of the banking sector. To optimize banking it is necessary to find the managing factor, namely, the financial relationships that have the greatest impact on value added growth of the bank and subjected to the management of the agent, and setting the value to which we could increase the effectiveness of bank management in the system of stakeholders' financial relations.

3. Empirical results

Let's estimate the unknown parameters a_j for each j-th year in all three linear models using matrix MNK (3), moreover we choose coefficients in the range of $0<\alpha_j, \beta_j<1$ by sorting them in this range. The best model for each year will be considered the one that has the highest quality, namely, the highest value of the determination coefficient (9). As the present model has lagged variables, using statistics for 6 years we will estimate the unknown coefficients of the model only for the last 5 years.

Table 2. Values of the determination coefficient (R^2 %) for the period of 2008-2012 in accordance with the six selected models of evaluation

	2008 p.	2009 p.	2010 p.	2011 p.	2012 p.
1 model	20%	39%	28%	47%	47%
2 model	20%	50%	39%	47%	71%
3 model	-	48%	32%	47%	71%
4 model	39%	45%	56%	72%	90%
5 model	89%	58%	66%	65%	89%
6 model	-	66%	59%	72%	90%

According to the data in Table 2 the optimal model for 2008 is the fifth model as the coefficient is close to one, and in percentage is equal to 89 %. This means that in 2008 the effectiveness of the bank corporate governance is characterized by 89% constancy financial relations of the bank stakeholders and only 11% by other factors which include directly external institutional factors and factors of institutional

influence. For 2009 we determine the sixth model as optimal one and the fifth model - for 2010; the coefficient of determination (R^2 %) herewith is amounted to 66%. This effect we consider essential because during the period of 2009-2010 the impact of external factors and sustainability of financial relations with public authorities, other financial and credit institutions at the national and international level become increasingly important at the stage of economic crisis period.

Thus, the impact of these financial relations of indirect effect explains the effectiveness of bank management in the system of financial relationships of their stakeholders in 2009 and 2010 by 44%. For 2011 and 2012 according to the coefficient of determination (R^2 = 72% in 2011 and R^2 = 90% in 2012) the fourth model is optimal. It should be noted that since 2010 the coefficient of determination increases indicating the growing importance of sustainability development of financial relationships with the stakeholders of direct influence in the post-crisis period. We can assume that exactly sustainability of financial relationships with stakeholders of direct influence provide banks' willingness to critical fluctuations in the economy and allows to avoid reinforcing negative impact of the economic crisis, which is characterized by more complex financial relationships that provide banks by financial resources and assist banks in the post-crisis reincarnation.

Choice of the appropriate model has economic justification. Thus, the effectiveness of management decisions of the agent (the system of corporate governance) will implement only after a long period of time due to the objective process of long-term creating of added value, moreover, considering the gradual development of the economy in 2008, the very meaning of the efficiency of previous decisions of corporate governance and the quality of the existing financial relations in previous years determine the effectiveness of bank management in the system of financial relationships of their stakeholders.

Choosing the sixth model in 2009, which includes the effect of the established in the bank financial relations both - this period and prior periods, as well as the effectiveness of corporate governance last year and two years ago. This model has the largest number of lagged variables that are dependent and independent variables because of the attention in the peak of crisis period. The global financial crisis in 2009 has made adjustments in the development of each bank of the entire banking system in Ukraine and therefore, stable effectiveness of bank management in the previous periods (2007-2008) or its irregularity, negligence in financial relations between the agent and principals that form the loan and equity bank capital, ignoring the constant relations of first level agents and subagents in the analyzed period and last year made impact on the efficiency of bank management. In the following years the number of lagged variables will decrease since the post-crisis period reflects the beginning of the new stage of the banking system development.

First of all, it should be noted that the results and expectations of past pre-crisis period cannot act as a forecast basis or influence the bank management, as banks begin to operate in the new reality, changing relationships between stakeholders. Thus, to 2010 corresponds the fifth model that takes into account the interactions of bank stakeholders and the results of the bank efficiency of its activities during the crisis period. The fourth model using in 2011-2012 is treated in the need to build effective bank management exclusively on providing a stable sustainability of financial relationships of the bank stakeholders, thereby, considering their peculiarities of the previous year.

Thus, the system of equations is as follows:

$$\begin{cases} \vec{y}_j = \vec{X}_j\vec{a}_j + \alpha_j\vec{X}_{j-1} + \beta_j\vec{y}_{j-1} \\ \vec{y}_j = \vec{X}_j\vec{a}_j + \alpha_j\vec{X}_{j-1} + \beta_j\vec{y}_{j-1} + \beta_j^2\vec{y}_{j-2} \\ \vec{y}_j = \vec{X}_j\vec{a}_j + \alpha_j\vec{X}_{j-1} + \beta_j\vec{y}_{j-1} \\ \vec{y}_j = \vec{X}_j\vec{a}_j + \alpha_j\vec{X}_{j-1} \\ \vec{y}_j = \vec{X}_j\vec{a}_j + \alpha_j\vec{X}_{j-1} \end{cases} \quad (12)$$

We have built models and we face the problem of selecting such values of the factors x_2, x_3, x_7, x_8 and x_9, which reflect financial relationships of the bank stakeholders in order to all values φ_{ij} be equal to 1, where i = 1 .. n and j = 1 .. T. For this purpose all models received for 5 years we combine in the system of equations and solve it according to our relatively unknown factors x_2, x_3, x_7, x_8 та x_9, which will be expressed through other factors x_1, x_4, x_5, x_6, x_{10} and x_{11}. Factors x_2, x_3, x_7, x_8 and x_9, are basic and show financial relationship of the bank stakeholders that provide the greatest impact on value added growth of the bank; they are managed factors, i.e. such relationships are subjected to regulation and are under the direct control of the bank management. Six other parameters are free, i.e. their values, hypothetically, could be any of this kind. These parameters are more difficult to control and therefore, hypothetically, in this problem their value can be any of this kind. Each bank is trying to have the absolute efficiency with zero reserve, which indicates that this bank is on the edge of efficiency and can serve as a model for a certain bank. For banks with absolute efficiency the reserve of governance efficiency will be zero. Thus, in the proposed model values φ_{ij} = 1 and for the lagged variables we take the averaging values for all banks in a given year. We'll get 5 equations with five unknown x_2, x_3, x_7, x_8 and x_9.

Let's create the matrix A as follows,

$$A=\begin{pmatrix} a_{12} & a_{13} & a_{17} & a_{18} & a_{19} \\ a_{22} & a_{23} & a_{27} & a_{28} & a_{29} \\ a_{32} & a_{33} & a_{37} & a_{38} & a_{39} \\ a_{42} & a_{43} & a_{47} & a_{48} & a_{49} \\ a_{52} & a_{53} & a_{57} & a_{58} & a_{59} \end{pmatrix} \quad (17)$$

The system of equations 16 is not generated in case if the matrix (17) *det (A)* ≠ 0. In this case the system is not generated, so we have a clear solution. If the system were degenerated, then it would be necessary to reduce the number of basic variables by one and then solve the system of four equations.

Thus, according to the formula 16 the system of equations is as follows

$$\begin{cases} \vec{y}_1 = -0,11-14,46\tilde{o}_1-9,76\tilde{o}_2-3,66\tilde{o}_3-1,83\tilde{o}_4+1,41\tilde{o}_5+3,49\tilde{o}_6+10,36\tilde{o}_7+7,81\tilde{o}_8+ \\ +0,52\tilde{o}_9-0,28\tilde{o}_{10}+3,11\tilde{o}_{11}+9,13\tilde{o}_{01}+5,99\tilde{o}_{02}-0,34\tilde{o}_{03}-0,11\tilde{o}_{04}-1,48\tilde{o}_{05}-0,95\tilde{o}_{06}- \\ -5,19\tilde{o}_{07}-2,01\tilde{o}_{08}-2,36\tilde{o}_{09}+0,37\tilde{o}_{010}+0,11\tilde{o}_{011}+\vec{y}_0 \\ \vec{y}_2 = -0,34-11,01\tilde{o}_1-7,63\tilde{o}_2-2,07\tilde{o}_3-0,33\tilde{o}_4-0,32\tilde{o}_5-1,32\tilde{o}_6-7,32\tilde{o}_7- \\ -2,34\tilde{o}_8-3,86\tilde{o}_9+0,16\tilde{o}_{10}+38,94\tilde{o}_{11}+12,61\tilde{o}_{11}+10,79\tilde{o}_{12}+6,764\tilde{o}_{13}+1,62\tilde{o}_{14}+ \\ +0,02\tilde{o}_{15}+1,54\tilde{o}_{16}+6,48\tilde{o}_{17}+3,37\tilde{o}_{18}+1,52\tilde{o}_{19}-0,10\tilde{o}_{110}-51,69\tilde{o}_{111}+0,7\vec{y}_1+0,49\vec{y}_0 \\ \vec{y}_3 = 0,36-0,73\tilde{o}_1-0,03\tilde{o}_2-5,60\tilde{o}_3+0,02\tilde{o}_4+0,03\tilde{o}_5+0,31\tilde{o}_6-4,39\tilde{o}_7-1,63\tilde{o}_8+ \\ +0,06\tilde{o}_9+0,05\tilde{o}_{10}+7,57\tilde{o}_{11}+4,50\tilde{o}_{21}+2,78\tilde{o}_{22}+7,57\tilde{o}_{33}-0,07\tilde{o}_{34}+0,12\tilde{o}_{35}-0,42\tilde{o}_{36}+ \\ +0,06\tilde{o}_{37}-0,35\tilde{o}_{38}+0,32\tilde{o}_{39}-0,03\tilde{o}_{310}-9,07\tilde{o}_{311}+0,8\vec{y}_2 \\ \vec{y}_4 = 1,24-0,63\tilde{o}_1-1,47\tilde{o}_2+1,39\tilde{o}_3-0,20\tilde{o}_4+0,03\tilde{o}_5+0,27\tilde{o}_6-3,19\tilde{o}_7-0,52\tilde{o}_8+ \\ +1,57\tilde{o}_9-0,20\tilde{o}_{10}+6,09\tilde{o}_{11}+0,32\tilde{o}_{41}-0,32\tilde{o}_{42}-0,72\tilde{o}_{43}-0,46\tilde{o}_{44}+0,33\tilde{o}_{45}+0,27\tilde{o}_{46}+ \\ +0,82\tilde{o}_{47}+1,01\tilde{o}_{48}-0,35\tilde{o}_{49}+0,20\tilde{o}_{410}-4,07\tilde{o}_{411} \\ \vec{y}_5 = 1,41+3,57\tilde{o}_1+2,59\tilde{o}_2+20,98\tilde{o}_3+0,28\tilde{o}_4-0,33\tilde{o}_5-1,23\tilde{o}_6-16,71\tilde{o}_7-13,89\tilde{o}_8+ \\ +13,11\tilde{o}_9-0,25\tilde{o}_{10}+1,11\tilde{o}_{11}-0,89\tilde{o}_{51}+0,45\tilde{o}_{52}-16,58\tilde{o}_{53}-1,93\tilde{o}_{54}-0,28\tilde{o}_{55}+0,47\tilde{o}_{56}+ \\ +5,38\tilde{o}_{57}+10,52\tilde{o}_{58}-13,10\tilde{o}_{59}+0,50\tilde{o}_{510}+5,04\tilde{o}_{511} \end{cases} \quad (18)$$

And matrix 17 for finding the solution of our problem is

$$A=\begin{pmatrix} -9,78 & 3,66 & 10,36 & 7,81 & 0,52 \\ -7,63 & -2,07 & -7,32 & -2,34 & -3,86 \\ -0,03 & -5,60 & -4,39 & -1,63 & 0,06 \\ -1,47 & 1,39 & -3,19 & -0,52 & 1,57 \\ 2,59 & 20,98 & -16,71 & -13,89 & 13,11 \end{pmatrix} \quad (19)$$

According to the research the factors x_2, x_3, x_7, x_8 and x_9 are expressed in terms of other factors x_1, x_4, x_5, x_6, x_{10} and x_{11} as follows:

x_9 = -0.1679277434 10^{11} + 0.1006388300 x_1 + 0.1355219899 x_4 - 0.5200778380 x_5 -0.2073169393x_6 + 36997.68816 x_{10} + 778799.7172 x_{11};

x_8= -2090253.240 - 2.205883368 x_1 - 4.322024522 x_4 + 6.677315307 x_5 + 0.8058218258 x_6 - 1607067.970 x_{10} + 11821610.50 x_{11};

x_7= -62900933.73 + 0.3069553964 x_1 + 2.350220538 x_4 - 57.56668813 x_5 -13.19740602x_6 + 2056413.583 x_{10} + 54243263.42 x_{11};

x_3= 91425293.98 + 15.44064201 x_1 + 3.461400299 x_4 + 11.88754258 x_5 + 21.63363630 x_6 - 1232007.799 x_{10} - 110439944.1 x_{11};

x_2= -6723055.239 - 0.2304462554x_1 + 2.105610744x_4 - 3.185035690x_5 - 2.880181932x_6 + 720794.0423x_{10} + 8742588.651 x_{11}.

Table 3. Effect of secondary factors on the secondary ones under the conditions of the bank optimal management through the absolute efficiency of corporate governance in it

	a	x_1	x_4	x_5	x_6	x_{10}	x_{11}
x_9	−	+	+	−	−	+	+
x_8	−	−	−	+	+	−	+
x_7	−	+	+	−	−	+	+
x_3	+	+	+	+	+	−	−
x_2	−	−	+	−	−	+	+

Thus, the conditions for the providing efficiency of the bank management in the system of financial relations of their stakeholders expressed through the effectiveness of corporate governance allow to determine the appropriate factors that are basic and easily managed by the bank, and the parameters that are hardly managed. The proposed econometric model that takes into account the lag decisions of corporate governance enables to analyze quite widely the bank activity, to identify ways of its improvement in order to increase efficiency.

Determined factors in such way allows us to analyze the impact of each of the secondary hard managed factor that characterizes financial relationships of the bank stakeholders to the primary easily managed factors under optimal bank management expressed through the effectiveness of corporate governance in it. Table 3 shows this effect.

Studies demonstrate that the efficiency of the banking system under conditions of transformation processes in Ukraine to the international financial sector is highly dependent on maintaining their own development opportunities, primarily due to the sustainability development of financial relationships of bank stakeholders.

On the influence of the primary factors the CEO can affect. Primary easily managed (controlled, regulated) financial relations are restricted by the bank and include a strategy for its development, the structural problems of production management and banking, all kinds of resources, profitability of banks, production capacity, research and development activities, competitiveness. The primary factors can take different values in solving problems affecting their secondary factors that generate many alternative solutions. Herewith, secondary factors can substantially affect the results of decisions and effective management of the banks. The results of Table 3 reflect that the impact of secondary hard managed factors on factors that are subjected to regulation by management has a different area of influence.

4. Conclusion and concluding remarks

So, we have analyzed 50 banks which constitute 60% of Ukrainian banking system, that include representatives from all four groups that are under the control of foreign and domestic capital and it allows to determine the major trends influence of financial relations on the bank management effectiveness in the system of financial relations of their stakeholders. Determining factors in such way we define that basic financial relations, which are characterized by funds of legal entities (x_2) and loans and liabilities of individuals (x_8), funds of banks (x_1) has a negative impact. The "principal-agent" financial relations related to the formation of bank financial resources specified by features of their circulation (issued as securities) influence negatively only on loans and liabilities of individuals (x_8), i.e. on the cross-cutting financial relations "agent- subagent" deal with substitution of the agent functions completely or partly which are obtained from the "principal". Securities held for trading (x_5) positively affects the "principal-agent" financial relations (individuals' funds (x_3)) and "agent-subagent" (loans and liabilities of individuals (x_8)) only if principal or agent is acting as individuals. At the same time, specific hard managed factor, expressed as a share of equity in the banks' liabilities (x_{10}) has a negative impact on the above- mentioned group of financial relations. Financial relations that affect absolutely all the directions of the bank added value growth expressed by the individuals' funds (x_3) depend on the negative impact of the share of assets in the total assets of the banking system (x_{11}). However, the results show positive role of individuals as s bank' stakeholders in the system of "principal-agent" financial relations, since individuals are the main fighters in the case of violation of their rights as depositors.

Thus, the sustainability of the bank' stakeholders financial relations expressed by the system of corporate governance, shareholders, creditors, persons involved in active transactions related to the bank's activities that generates wealth can act as potential beneficiaries and as possible victims. Rather important is the specification of positive and negative consequences of disharmonization of financial relations for individual stakeholders groups.

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Appendix A

Indicators used in assessment of the effectiveness of banks' management in the system of financial relations.

Indicator	Financial relations of the bank's stakeholders	Characterization of the financial relationships based on modified model of "principal-agent"	Type of the factor
x_1	Funds of banks	The "principal-agent" financial relations related to formation of the bank debt capital. "Principal" acts as the banking institution.	Secondary (hard managed)
x_2	Funds of legal entities	The "principal-agent" financial relations related to formation of the bank debt capital. "Principal" act as legal entities.	Primary (easy managed)
x_3	Funds of individuals	The "principal-agent" financial relations related to formation of the bank debt capital. "Principal" act as individuals.	Primary (easy managed)
x_4	Debt securities issued by the Bank	The "agent-subagent" financial relations related to formation of the bank debt capital. "Principal" act as individuals and/or legal entities. Auxiliary tool (agency contract) is debt securities issued by the bank.	Secondary (hard managed)
x_5	Securities held for trading	The "agent-subagent" financial relations associated with substitution of the function, derived from the "principal". "Subagent" acts as individuals and/or legal entities.	Secondary (hard managed)
x_6	Funds in other banks	The "agent-subagent" financial relations associated with substitution of the function, derived from the "principal". "Subagent" acts as other banking institutions.	Secondary (hard managed)
x_7	Loans and liabilities of legal entities	The "agent-subagent" financial relations associated with substitution of the function, derived from the "principal". "Subagent" acts as legal entities.	Primary (easy managed)
x_8	Loans and liabilities of individuals	The "agent-subagent" financial relations associated with substitution of the function, derived from the "principal". "Subagent" acts as individuals.	Primary (easy managed)
x_9	Share capital	The "principal-agent" financial relations related to formation of the bank equity capital. "Principal" acts as bank' shareholders.	Primary (easy managed)
x_{10}	The share of equity in the banks' liabilities	An index that characterizes the complex nature of "principal-agent" financial relationships associated with the formation of debt and bank equity capital.	Secondary (hard managed)
x_{11}	The share of assets in the total assets of the banking system,%	An index that characterizes the bank' "agent-subagent" financial relationship to the financial relationship "agent-subagent" of Ukrainian banking system.	Secondary (hard managed)